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PICKETT (A. D.). **The Army Worm Outbreak in Nova Scotia in 1937.**—*Canad. Ent.* **70** no. 4 pp. 86–87. Orillia, April 1938.

Detailed records are given of the local distribution of a severe outbreak of *Cirphis unipuncta*, Haw., in Nova Scotia in 1937. The larvae occurred in the last few days of July and the first half of August, most of them pupating during the latter period. Cereals (wheat, barley and oats, in order of attraction) were particularly attacked; in some fields, wheat was heavily attacked, while oats and barley were hardly damaged. Maize was badly injured, when the migrating larvae encountered it, turnips and mangels slightly so, but potatoes did not appear attractive. A report from New Brunswick that clover in newly seeded grain fields was not attacked did not apply to Nova Scotia, where clover and timothy [*Phleum pratense*] were badly damaged. Grass, both on lawns and in orchards, was in some cases completely destroyed. Poisoned bran baits gave good control where properly applied, but the larvae were sometimes so numerous that the recommended quantity (25 lb. bait per acre) was not sufficient, especially where lead and calcium arsenates were used. In increased quantities, these poisons gave satisfactory control, but were considerably slower in effect than Paris green or sodium arsenite.

The only outbreaks of *C. unipuncta* previously recorded in Nova Scotia were in 1914 and 1920, and these, though severe, were less widespread than that of 1937. It has been suggested that the larvae do not ordinarily survive the winter in the province, but the winters of 1935–36 and 1936–37 had been comparatively mild, and the larvae had been abundant in one small area in 1936. It is thus possible that the insect became established in this area as a result of the moths migrating there from the south in the spring of 1936 or, more probably, in the autumn of 1935.

FLEMING (W. E.), BAKER (F. E.) & KOBLITSKY (L.). **Effect of applying Acid Lead Arsenate for Control of Japanese Beetle Larvae on the Germination and Development of Evergreen Seedlings.**—*J. For.* **35** no. 7 pp. 679–688, 2 figs. Washington, D.C., July 1937. [Recd. May 1938.]

The following is taken from the authors' summary: The effect on *Pseudotsuga taxifolia, Larix occidentalis, Thuja plicata* and various species of pine and spruce of applying acid lead arsenate to the seed beds to protect germinating seeds and young seedlings from attack by the larvae of the Japanese beetle [*Popillia japonica*, Newm.] and the closely related white grubs native to the United States [*cf. R.A.E.*, A **14** 526] was investigated during 1934 and 1935. Germination of the seeds was not significantly modified by the application of acid lead arsenate to the soil at rates of up to 1,500 lb. per acre, but the growth of most of the seedlings was retarded. With *Pinus jeffreyi, P. ponderosa* and *P. caribaea*, applications at rates of 500, 1,000 and 1,500 lb. per acre reduced the growth by 38·7, 47·3 and 50·9 per cent., respectively. Most of the seedlings showed browning of the foliage, which varied from a browning of the tips of the needles to complete discolouration. In pines, the amount of arsenic trioxide absorbed from the soil varied from 90 parts per million in the 500 lb. treatment to 144 parts per million in the 1,500 lb. treatment. An average of

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78 per cent. was found in the roots and 22 per cent. in the tops. It is concluded that treatment with acid lead arsenate is undesirable until a method is evolved of using the material without danger to the plants.

HEADLEE (T. J.). **Factors underlying Codling Moth Control under heavy Infestation Conditions.—Satisfactory Procedure.**—*Trans. Peninsula hort. Soc.* 1937 pp. 111–116. Dover, Del., 1938.

The increased infestation of apples by the codling moth [*Cydia pomonella*, L.] that has occurred of recent years in various parts of the United States has resulted in intensified applications of lead arsenate, and, in some cases, the sprays have caused such damage to the foliage and fruit buds that the crop has been reduced both in the year of application and in the following year. In this paper, the procedure considered most likely to give satisfactory control without harming the trees is outlined. During the winter, packages and props used during the previous season may be freed from overwintering larvae by bringing them to a temperature of 130°F. Measures should be taken to prevent the escape of moths from larvae overwintering in packing sheds; if this is done, packages and props can be left in the sheds until the moths have all emerged and died. The rough, corky bark round trunks and branches should be scraped off and this and prunings burnt, and cracks that cannot be scraped should be treated with pine oil. In the summer, bands and sprays should be used. Bands should be put in place by 15th June and removed about 1st November. The chemical used for treated bands has usually lost its effectiveness by this time, and if the bands are left, adults emerge from them in the spring. Spraying with lead arsenate kills the larvae; 0·6–0·75 per cent. of a safe summer oil added to the lead arsenate kills all the eggs hit and acts as an adhesive, and 1 pint nicotine sulphate added to 100 gals. of the spray kills the adults if they are trapped by applying the spray from above and below. Fixed nicotines apparently do not harm the foliage and are as toxic to the larvae as lead arsenate, but cost slightly more. However, they should produce no residue necessitating washing. As in the case of lead arsenate, the addition of summer oil and free nicotine improves control. Sprays should be carefully timed and directed principally against the first brood, and care should be taken that coverage is complete and well maintained. Five sprays against the first brood are required in a heavy infestation and may be followed if necessary by three against the second brood.

AMOS (J. M.). **Suggestions for improved Codling Moth Control based on Experience in Indiana.**—*Trans. Peninsula hort. Soc.* 1937 pp. 117–119. Dover, Del., 1938.

In discussing the control of the codling moth [*Cydia pomonella*, L.] on apple in Indiana, the author points out that, in such a large state, the use of bait traps and emergence cages to determine the progress of infestation in individual orchards is advisable to ensure efficient control, which can only be obtained by accurate timing and thoroughness in the application of lead arsenate sprays and, where heavy infestations are present, the use of various supplementary measures. The moth is a serious pest in the southern part of the state, but can be easily controlled a little to the north. Variation in topography and soil probably contribute to this great difference of population, as the rolling sandy

slopes of the south warm up earlier in spring than do the heavy soils north of Indianapolis. There is, however, a variation of only a few days in the blooming date of apples.

STEARNS (L. A.). **Comments on the Control of several Fruit and Vegetable Insects.**—*Trans. Peninsula hort. Soc.* 1937 pp. 120–126. Dover, Del., 1938.

Notes are given on the results of investigations on the control of various pests in Delaware in 1937. *Anthonomus signatus*, Say, was abundant on strawberries in the same area as in 1936 [*R.A.E.*, A **25** 466] and was reported from many other localities. As it has been found that over 90 per cent. of the weevils overwinter in sheltered situations within 100 ft. of strawberry plantings, burning over the hibernation quarters is recommended ; if this is impossible or inadequate, two applications of a spray or dust, the second three weeks before harvest, should be made. A dust of sulphur and lead or calcium arsenate (17 : 3), at the rate of 10–30 lb. per acre, and a spray of cryolite (4 lb. per 100 U.S. gals.) gave satisfactory control, but under the same conditions, derris (4 per cent. rotenone) was somewhat less effective.

Macrosiphum onobrychis, Boy. (*Illinoia pisi*, Kalt.) interfered with the production of peas for canning in many states in the east and middle west. A nicotine sulphate dust or a spray of derris or cubé is recommended ; the formulae and spray pressure are the same as those given elsewhere [**25** 622]. The dust should be applied under a trailer 100 ft. long, made of air-tight material, and a wetting and spreading agent should be used in the sprays. In trials of 12 spray and dust combinations, sprays reduced infestation more than dusts. Combinations including derris were more satisfactory than those including nicotine, the best being 3 lb. derris (4 per cent. rotenone), with 1 U.S. pint sulphated fatty alcohol containing a synthetic adhesive per 100 U.S. gals. spray, which reduced the population by about 85 per cent. as compared with that on an untreated plot.

A large quantity of rhubarb, heavily infested with *Empoasca fabae*, Harr., was examined late in June. The rhubarb was also severely attacked by leaf spot. Few of the leafhoppers had reached the adult stage. Bordeaux mixture, the standard control for leaf spot, repels ovipositing females of *E. fabae* and kills the young hoppers. In experiments on rhubarb, Bordeaux mixture (8 : 8 : 100) and a dust of calcium arsenate, copper sulphate and lime (1 : 1 : 3) were the best of 15 treatments tested by a single application each on 2nd July.

In tests of substitutes for lead arsenate and wheat flour or hydrated lime and aluminium sulphate as sprays for protecting the foliage of fruit trees from injury by *Popillia japonica*, Newm., encouraging results have been obtained with a combination of derris and resin residue, a tetramethyl thiuram bisulphide mixture and thiodiphenylamine (phenothiazine) [*cf.* **25** 424]. Experiments on the control of *Conotrachelus nenuphar*, Hbst., and *Cydia* (*Grapholitha*) *molesta*, Busck, on peaches were made with the following substances, which are listed in order of efficiency : lead arsenate, thiodiphenylamine, cryolite, tetramethyl thiuram bisulphide, and derris used, respectively, at rates of 2, 4, 3, 4, and 4 lb. per 100 U.S. gals. In each case, 6 lb. magnetic sulphur was added as a fungicide, 1 lb. resin residue was added to all the spray mixtures, except cryolite, and 4 lb. zinc sulphate and

5 lb. hydrated lime were included with lead arsenate. Three applications were made, one immediately after petal fall, one at the shuck-slip stage and one a fortnight later. Lead arsenate gave the best control of the insects, but when the conditions of the foliage and the quality of the peaches were taken into consideration, there was only a slight balance, if any, in its favour. All dropped peaches infested by first-generation larvae of *Conotrachelus* should be collected and destroyed to reduce infestation by the second generation. The results of experiments on the control of *Cydia* (*Carpocapsa*) *pomonella*, L., on apple confirmed those of previous years [**25** 562, etc.].

RICE (P. L.). **Cat-facing of Peaches by the Tarnished Plant Bug, *Lygus pratensis* (L.).**—*Trans. Peninsula hort. Soc.* 1937 pp. 131–136, 3 figs., 6 refs. Dover, Del., 1938.

Investigations during 1937 to determine the agent responsible for cat-facing of peaches [*cf. R.A.E.*, A **16** 680] in Delaware, made by enclosing *Lygus pratensis oblineatus*, Say, and 8 species of Pentatomids in cages over twigs bearing two or more young fruits, showed that the deformity was caused by the Capsid. Pentatomids (which occurred in small numbers on the peach trees in late April, but were almost absent after mid-May) produced two types of injury, one of which might be termed cat-facing, but did not appear the same as that which was prevalent in the orchard. It was produced on a single peach exposed to *Hymenarcys nervosa*, Say. *Lygus* was more abundant than all the Pentatomids combined. It was not taken in the orchard until 3rd June, but was probably present on 27th May as cat-facing had begun to appear at that time, when the fruits were just over an inch in diameter. The blemishes were circular, depressed areas, usually covered by the dead, cracked epidermis and less than $\frac{1}{16}$ inch in diameter. By 27th July, they had increased in size, the overlying epidermis had largely disappeared, and a slight exudation of gum covered the injured area. In the cages, the blemishes most resembling those in the orchard were made by adults of *Lygus* taken from clover and confined on 27th May, and injury in the orchard was most evident on border rows next to an apple orchard with a cover crop of clover. Here, 5–10 per cent. of the peaches showed cat-facing, and in the other block under observation not more than 1 per cent. The first-generation adults are abundant when the clover is cut, and they then migrate to the peaches. In the field under discussion, this occurred about 25th May. Injury may be kept at a minimum by clean culture, by keeping land round orchards free from weeds, and by refraining from planting leguminous crops near them.

CROSTHWAIT (S. L.). **The Japanese Beetle Retardation Program in Maryland for 1938.**—*Trans. Peninsula hort. Soc.* 1937 pp. 137–139. Dover, Del., 1938.

A brief account is given of the feeding habits of adults and larvae of the Japanese beetle [*Popillia japonica*, Newm.], the injury it causes, the usual methods of control, and the programme for preventing its spread in Maryland, parts of which have had to be placed in the regulated area. Some sections in the north are heavily infested, and a great amount of damage is being done ; most of the rest of the state is lightly infested, small numbers of beetles having been caught in the towns.

BENNETT (C. W.) & WALLACE (H. E.). **Relation of the Curly Top Virus to the Vector** *Eutettix tenellus*.—*J. agric. Res.* **56** no. 1 pp. 31–51, 4 diagr., 20 refs. Washington, D.C., 1938.

An account is given of experiments carried out in California over a period of 6 years on the relation of the curly-top virus to the beet leafhopper, *Eutettix tenellus*, Baker. The tests to obtain evidence of the concentration of the virus in individual leafhoppers or to demonstrate its presence in various parts of the leafhoppers or in insects that are not vectors were made by feeding uninfected leafhoppers on extracts prepared from the insects or the parts of them to be tested and then ascertaining the infectivity of these leafhoppers to beet.

The following is substantially the authors' summary of the results : The leafhoppers picked up virus from diseased beet plants in a feeding time of 1 minute, and viruliferous leafhoppers infected healthy plants in a feeding time of 1 minute. However, the minimum time for an individual leafhopper to pick up and transmit the virus was 4 hours. Leafhoppers on diseased plants acquired sufficient virus in 2 days to give them their maximum ability to infect seedling beets. A longer period was necessary to enable them to acquire their maximum charge of virus. A fasting period of 18 hours decreased the ability of leafhoppers to produce infection in the first two 6-minute feedings following the fasting period. Feedings following a fasting period of 15–180 minutes produced more infection than those following shorter or longer periods. Virus was obtained from the salivary glands, faeces and alimentary tract of the leafhopper, but its more abundant recovery from the blood indicates that the blood is the chief virus reservoir. Both virus content and ability to cause infection gradually decreased over periods of 8–10 weeks in leafhoppers confined to a very resistant or immune plant (*Atriplex semibaccata* or maize). This was true, regardless of the size of the initial charge of virus in the leafhoppers. Leafhoppers that had a low charge of virus, acquired by a 6-hour feeding on an extract from viruliferous leafhoppers, lost the power to cause infection after 54 days when transferred daily on small beet plants, but leafhoppers that had lost the power to cause infection regained it when allowed a short feeding period on infected beets. These facts proved that if there is any multiplication of the virus in the leafhopper, it is not sufficient to maintain the original virus content. It seems probable that there is no multiplication.

Individual leafhoppers vary greatly in their ability to transmit virus. The results of selecting and mating leafhoppers in successive generations indicated that it is possible to produce strains lower or higher than normal in ability to transmit virus in short interval feedings, but no individuals inherently lacking in ability to transmit were discovered.

The following non-vectors acquired the virus by feeding on infected plants : *Myzus persicae*, Sulz., *Aphis rumicis*, L., *Pemphigus betae*, Doane, *Aceratagallia californica*, Baker, *Phlepsius strobi*, Fitch, *Empoasca solana*, DeLong, *Hercinothrips* (*Hercothrips*) *femoralis*, Reut., and *Tetranychus* sp. When transferred to healthy plants, they retained the virus for periods ranging from less than one day, in the case of *Hercinothrips*, to 21 days, in the case of *Aceratagallia*.

SQUIRE (F. A.). **Report on a Visit to Antigua.**—17 pp. multigraph, 3 figs., 12 refs. St. Vincent, B.W.I., January 1938.

This is the report of a visit made to Antigua in November 1937 to investigate the status there of *Platyedra gossypiella*, Saund., on cotton.

The distribution of cotton on the island is given, and the soil, climate and vegetation are discussed at some length. The relative humidity is higher than in some islands with a heavier rainfall, as the soil is highly retentive of moisture, though this is largely counteracted by a north-east trade wind, which blows nearly all the year round. During the visit, the cotton crop, which had been planted during July, August and September, was in all stages between flowering and picking. The average infestation was 1·5 per cent. of flowers from 11 localities and 2·1 per cent. of bolls from 5. The infestation was widely distributed, rising as high as 5 per cent. in some places, which suggests that it was carried over in the field. In Antigua, the close season lasts only 6 weeks, and boll residues from the previous crop were still present in September. In Barbados, under similar conditions, resting larvae have been found in residue three months after pulling. Of the other possible sources of re-infestation examined, the most important was wild cotton, a considerable amount of which had been found and eradicated during the previous year or two. Less than two dozen sporadic seedlings or ratooned plants were found, all in recent clearings, but 3 or 4 dozen cotton bushes were discovered in 4 hours in fringing forest beside slow-running streams. A few plants that had apparently sprung up during the season were found in the savannah country of the central plain. The campaign against wild cotton should be continued. Two birds common in Antigua build their nests of wild cotton from February to June. In these nests are a large number of seeds containing resting larvae. All the nests had disappeared by November, but it is probable that moths emerging from them were able to re-infest early cotton planted in July. Planting in September is therefore recommended. Of reputed and possible secondary food-plants, *Thespesia populnea*, *Urena lobata* and *Abutilon indicum* were common, but were not found to be infested.

Laboratory experiments have shown that moisture accelerates pupation of resting larvae [*R.A.E.*, A **26** 83]. The average rainfall for May, June, July and August in Antigua was slightly lower than that for the same months in Barbados, but higher than that for March, April, May and June in the latter island. As March–June is the period for which resting larvae have been found to survive in the field in Barbados, it is thought that a close season in Antigua from May to August, inclusive, might ensure the disappearance of resting larvae there. As dormant larvae often leave the seeds when cotton is being sunned and sorted, and establish themselves in the cotton houses where conditions are excellent for a long diapause, sorting houses should be free from cracks and crevices, and sorting should be done out of doors at least 30 ft. from the nearest building whenever possible. Fumigating the seed cotton brought in every day is also beneficial. The entry of seed cotton from Barbuda should be prohibited until the crop is over in Antigua.

TUCKER (R. W. E.). **The Control of Scarabee** (*Euscepes batatae*, **Waterh.) in Barbados.**—*Agric. J. Barbados* **6** no. 4 pp. 133–156, 3 diagr. Barbados, October 1937. [Recd. May 1938.]

In Barbados, damage to sweet potato by *Euscepes batatae*, Waterh., the larvae of which feed and pupate in the tubers and stems, is severe only in the low-lying and drier coastal areas with black soil. The only known alternative food-plant is *Ipomoea biloba*, which is restricted

to the sea shore. Of the two types of sweet potato grown, the one that matures within 3 months is much less injured than the one that remains in the soil for 6 months or more.

The young adults emerge from the place of pupation, when fully hardened, by boring tunnels to the exterior. Adults kept with food lived for an average of 4 months and a maximum of $10\frac{1}{2}$. Without food or water, they did not live longer than 45 days, but it was found that they can survive for some months when buried in the soil, a fact of importance in the spread and persistence of infestation in the field. They could withstand a considerable period of immersion in water. They feed by eating shallow pits on the surface of tubers. Males and females were reared in the laboratory in approximately equal numbers. They did not seem able to fly, but could walk with ease up a vertical wet glass surface. The eggs were normally laid in shallow pits made in the tubers or stems, and sometimes a short way up the leaf-stem above the axil, and were hidden and presumably protected from predators by an anal secretion, under which the young larvae bored directly into the surface. Females could lay fertile eggs for 4–6 months, usually starting about 15 days after emergence, and the eggs hatched in 6–7 days. Eggs laid by unmated females were not fertile. The larval stage averaged 20 days when the tuber was fresh and newly attacked, but lasted 30 days or more under unfavourable conditions, a fact that helps the infestation to continue, as infested material is often left to rot in the fields. The pupal stage lasted 7–9 days.

The main source of field infestation is probably the planting of infested cuttings. Of 18,705 cuttings examined from more or less severely infested fields, 21·0 and 0·21 were the highest and lowest infestation percentages, respectively, the mean being 4·11. The latter gives at least a possible 50 female beetles per acre, and experiments showed that females lay an average of 106 eggs per month for 4 months, the rate of laying being practically constant. Progeny figures were highest about June and November, which are the principal planting months.

Laboratory and field data indicated that control must be obtained by field sanitation, by avoidance of planting near a field recently planted with sweet potatoes, and, above all, by using uninfested cuttings. Details are given of tests in 1936 of different treatments, using five randomised plots for each treatment and each of two controls. Each plot was planted with 48 cuttings, and those used for all plots except one of the control series were moderately infested with eggs or larvae. The net average yield per plot was 33·6 lb. for the controls with infested cuttings and 67·8 lb. for controls planted with selected non-infested cuttings. The figures for soil treatment with lead arsenate, Ialine fumigant and 2 per cent. pyridine solution were 54·6, 23·2 and 53·5 lb., respectively, but the process was laborious and expensive. Dipping cuttings in insecticides before planting caused heavy failures in growth and failure to form tubers, without preventing infestation. Lead arsenate sprays gave net average yields of 105·8 lb. using a colloidal solution, and 115·8 lb. using 2 oz. lead arsenate to 4 gals. water and molasses as adhesive, the latter being the only economical as well as practical method. The figure for dusting with Dutox [barium fluosilicate] was 75·5 lb. Further experiments confirmed the efficiency of 3 sprayings with lead arsenate at the same rate (equivalent to 7·5 lb. per acre), which minimised but did not prevent infestation, and appeared to stimulate both yield

and growth. It also acted as a general pest control, and was shown to be definitely economic at a cost of about £1 per acre, not including field labour and water transport, taking a low average figure per acre of crop as a standard. Hill planting gave a higher yield than flat planting. Irrigation increased the total yield of a block of 40 plots from 465·5 to 1,173 lb. and decreased infestation from 85·28 to 70·16 per cent. Control measures must be preventive as infestation can, in most cases, only be determined when tubers have formed, and when these are infested no control measure is effective or economic.

Tucker (R. W. E.). **Larval Dispersion of** *Diatraea saccharalis*.—*Agric. J. Barbados* **6** no. 4 pp. 157–169, 4 diagr., 3 refs. Barbados, October 1937. [Recd. May 1938.]

The following is substantially the author's summary : In experiments on plots of sugar-cane in Barbados in 1935, 1936 and 1937, 95 per cent. of the eggs of *Diatraea saccharalis*, F., on certain plots were destroyed before they could hatch. These plots are referred to as sterilised. The lay-out of each experiment is given, together with the method and results. In all cases, results showed a degree of infestation of the sterilised plots by *D. saccharalis* that could only be explained by larval dispersal. This is shown to be by drift of newly hatched larvae on air currents, and to be sufficient to make all results of statistical analyses of treatments non-significant. The numbers of *Diatraea* eggs laid in sterilised and normal plots were very similar, showing that dispersal of the moths also occurs. It is therefore considered futile to use ordinary plot or block experiments to prove control by the parasite, *Trichogramma minutum*, Riley [*cf. R.A.E.*, A **23** 420] on a statistical basis, particularly as *Trichogramma*, accustomed to a cane-field habitat, also has a considerable power of dispersal.

Gregory (G. B.). **An Experiment on the Hand-collection of Egg-masses of Citrus Weevils (*Diaprepes* spp.) in St. Lucia.**—*Trop. Agriculture* **15** no. 5 pp. 112–114, 1 graph, 4 refs. Trinidad, May 1938.

An experiment on the hand-picking of egg-masses of *Diaprepes* spp. on lime trees 7 to 8 ft. high in St. Lucia is described. The time and cost incurred were so great that the method is regarded as entirely impracticable as a measure of control, except possibly on very young nursery stock.

Entomological Investigations.—*Rep. Coun. sci. industr. Res. Aust.* **11** (1936–37) pp. 15–24. Canberra, 1937.

Infestation of peaches by *Cydia molesta*, Busck, in the Goulburn Valley, Victoria, in 1936–37 caused a loss of 30 per cent. [*cf. R.A.E.*, A **25** 320] ; peaches in an irrigated district in New South Wales were also affected. Unsatisfactory results were obtained with sprays of acid lead arsenate, zinc sulphate and lime, and of nicotine sulphate with bentonite, or with bentonite-sulphur and white oil [*cf.* **25** 321], applied weekly from the time the peach fruits of the main crop were susceptible to attack until a week before harvest. A second consignment of *Macrocentrus ancylivorus*, Rohw., and *Glypta rufiscutellaris*, Cress., was received from the United States [*cf.* **25** 223], and some

2,000 were liberated. Both species have been recovered, but whether they can overwinter is not known. One of the most promising new insecticides for the control of *Cydia pomonella*, L., on apple is phenothiazine [thiodiphenylamine], but, when finely divided as a spray deposit, it oxidises and leaves a black film on the fruit. *Ephestia figulilella*, Gregson, attacked dried fruit in north-western Victoria. It appeared to have bred and multiplied on mummified grapes that had been left on the vines, and then to have spread to the packing sheds.

From 20th September to 28th November, a survey was made of the areas in New South Wales and southern Queensland infested by *Chortoicetes terminifera*, Wlk. [**25** 633]; the origin of the swarms was investigated and evidence was obtained of the existence of circumscribed outbreak centres. There are morphological differences between the solitary and gregarious phases in both *C. terminifera* and *Gastrimargus musicus*, F. The toad, *Bufo bufo*, which was introduced from England [**25** 321], did not appear able to attack larvae of *Oncopera rufobrunnea*, Tindale, in their burrows and no further experiments are to be made with it. Further investigations showed that *Smynthurus viridis*, L., was common in the extreme south-west of Victoria, but occurred only in isolated areas in other districts in this state and southern New South Wales [*cf.* **26** 84]. Larvae of the shelter bag moth, *Ochrogaster contraria*, Wlk. [on *Acacia*] are attacked by various parasites and by the predacious Pyralid, *Titanoceros thermoptera*, Lower. Defoliation can be reduced by cutting out the bags early in the year when they are about the size of a hen's egg, but care should be taken not to remove those containing the larvae of *T. thermoptera*. Attempts to introduce *Angitia fenestralis*, Hlmgr., from England against *Plutella maculipennis*, Curt., on cabbage were unsuccessful; this parasite has, however, been introduced into New Zealand, and it is hoped to obtain supplies from there when it has become established.

Powdered white arsenic was effective against two termites of the genera *Mastotermes* and *Calotermes* (*Cryptotermes*) that cause much damage to timber in Queensland, and the latter was also controlled by a 5 per cent. solution of paradichlorobenzene in kerosene. Grass-eating termites in pasture and aerodromes in Queensland and Northern Australia were killed when powdered white arsenic was introduced into their mounds; these species live underground for a considerable period before making their mounds and are then very difficult to find. In testing the susceptibility of different kinds of wood to termite attack, it was found that if a strip of susceptible wood was sunk in a circle round a mound of *Eutermes*, and the samples to be tested were placed against this strip, the termites came into fairly uniform contact with them. This method gave reliable indications of low resistance to attack in less than a year, while field tests with other methods had to be prolonged for at least 5 years before the results were considered definite.

In the Federal Capital Territory, further liberations were made of *Leucopis obscura*, Hal., and *Wesmaëlius concinnus*, Steph., against *Chermes* (*Pineus*) *pini*, L., on pines [**25** 321], but no recoveries of either species were made. *Encarsia formosa*, Gah., is effectively controlling *Trialeurodes vaporariorum*, Westw., in glasshouses and in the field in New South Wales and Victoria and has been established in South Australia. Recoveries have been made of the adults of

Lampyris noctiluca, L., introduced against the snail, *Helix aspersa* [**25** 321], and further supplies are to be imported from England and Belgium. Insects that have been forwarded to other countries include two consignments of *Gambrus stokesi*, Cam., against *Cydia pomonella* and *C. molesta* in the United States, and three consignments of *Leis conformis*, Boisd., against Aphids in Egypt.

Records are given of insects that may be suitable for introduction into Australia for the control of noxious weeds. *Anaitis plagiata*, L., and *Aphis chloris*, Koch, were imported from England against St. John's Wort (*Hypericum perforatum*). Of 6,000 overwintering larvae of *Anaitis* forwarded in cold storage, 2,600 arrived alive and were reared in the insectary ; 2,000 larvae of the following generation and a number of adults and eggs were liberated in Victoria. No recoveries have been made from previous liberations. From consignments of the overwintering eggs of *Aphis chloris* many generations were reared in the insectaries, but none of the eggs hatched in the following spring.

Insects attacking Noogoora burr (*Xanthium pungens*) that were imported from Texas were *Baris interstitialis*, Say (*callida*, Csy.) and the Lamiids, *Dectes spinosus*, Say, and *Ataxia hubbardi*, Fisher, the potential food-plants of which are to be studied, and *Euaresta aequalis*, Lw., which was liberated in Queensland. This Trypetid had previously been introduced from Kansas, and oviposited in burrs in the field, but adults of the next generation emerged three months before burrs were available for oviposition, so that it could not establish itself. Flies from Kansas burrs have emerged in March and April at Canberra, but in a large consignment of infested burrs from Texas many of the larvae overwintered. From 4,000 imported rootstocks of *X. pungens* heavily infested with larvae of *Dectes spinosus*, only 600 adult beetles emerged, about 50 per cent. of the larvae being parasitised. Starvation tests indicated that artichoke is the only plant of economic importance on which *Baris interstitialis* feeds. *Ataxia hubbardi* attacks several economic plants.

Tyria jacobaeae, L., and *Hylemyia* (*Pegohylemyia*) *seneciella*, Meade, were introduced from England against ragwort (*Senecio jacobaea*). There was a high rate of parasitism in about 20,500 pupae of *T. jacobaeae* that were received at Canberra. From the first generation reared in the insectary, 5,000 eggs, 300 larvae and 200 adults were liberated in a district in Victoria. The adults and larvae were at once attacked by the scorpion fly, *Harpobittacus* sp. This Bittacid has a very limited distribution, and it is hoped that liberations of the moth in other localities will be successful. From 25,000 puparia of *Hylemyia seneciella* sent in cool store to Canberra, only 210 adults emerged, and these refused to oviposit on the flower-heads of ragwort with which they were supplied.

NOBLE (N. S.). **The Egg Parasite of the Plague Grasshopper. Value as a Control Factor.**—*Agric. Gaz. N.S.W.* **49** pt. 3 pp. 143–146, 156, 7 figs., 2 refs. Sydney, 1st March 1938.

Scelio fulgidus, Crwf., was the only parasite bred from large numbers of the eggs of *Chortoicetes terminifera*, Wlk., collected in the field in various districts of New South Wales during the outbreaks of 1934–35 and 1937–38. In further observations on its bionomics [*cf. R.A.E.*, A **24** 69], daily dissections of the grasshopper eggs in the summer showed

that the durations of the egg stage, first and second larval instars, and pupal stage were about 1, 13, 7 and 11 days, respectively. The winter is passed in the first larval instar, and the life-cycle in over-wintering grasshopper eggs may be as long as 10 months. The percentage of parasitism varies greatly even in different parts of the same district. In order to determine how long the eggs of the host remained attractive to the ovipositing parasites, portions of egg-beds were covered immediately after the grasshoppers had oviposited and were exposed at intervals of 12 hours for a period of 2 days. Eggs were most attractive for 24 hours after they were deposited, but were still attractive when they were 48 hours old. After 7 days very few adult parasites were found on the egg-beds.

Brimblecombe (A. R.). **Hide Beetle Damage to Oregon Pine.**—*J. Aust. Inst. agric. Sci.* **4** no. 1 pp. 49–50, 1 fig. Sydney, March 1938.

An account is given of severe damage by larvae of *Dermestes vulpinus*, F., to rafters of Oregon pine (*Pseudotsuga taxifolia*) in a mill in Queensland, where infested bones and offal are continually received. The larvae had crawled up posts 24 and 36 ft. high in search of places for pupation and so had reached the rafters, into which they bored. Their mines were restricted to the spring wood (the softer part of the annual growth rings), but the damage was much more severe than would be indicated by the number of surface holes, as successive larvae had entered by the same holes and extended the mines in all directions. In some places, the spring wood was so injured that the timber had a laminated structure and its strength was reduced to the aggregate of the layers of autumn wood. The larvae and pupae in the timber were being attacked by the predatory Clerid, *Necrobia rufipes*, DeG.

Ahmad (T.). **The Tur-pod Fly, *Agromyza obtusa* Mall., as Pest of *Cajanus cajan*.**—*Indian J. agric. Sci.* **8** pt. 1 pp. 63–76, 1 pl., 10 refs. Delhi, February 1938.

An Agromyzid recently identified as *Agromyza obtusa*, Mall. (tur-pod fly or red-gram agromyza) has been known as an important and widely distributed pest of *Cajanus cajan* in India for over 32 years. In severe cases, 60 per cent. of the seeds may be damaged. All stages of the insect are described and illustrated, and an account is given of recent studies on its bionomics, summaries of which have already been noticed [*R.A.E.*, A **25** 530; **26** 242]. The maximum number of eggs laid by one female was 79 (in March 1937). With honey supplied as food, the adults lived for average and maximum periods of 5·4 and 6·8 days at 27°C. [80·6°F.], and 11·9 and 20·2 days at 18°C. [64·4°F.]. In March and April one brood is completed in about 3 weeks. There are authentic records of infestation of *C. cajan* from Burma and widely different climatic regions of India, but only during the period from October to April. In December and January, the insect is reduced to its minimum and is present only in the advanced larval and pupal stages inside the pods. Of these, 95 per cent. succumb to the influence of winter cold, the remaining 5 per cent. forming the only source of future infestation. If the relatively few infested pods are systematically collected and destroyed, the attack may be effectively reduced.

VENKITASUBBAN (C. S.). **Pests on Coconuts in the State.**—*Bull. Dep. Agric. Cochin St.* Ent. Ser. no. 4, 20 pp., 4 pls. Ernakulam, 1938.

A popular account is given of the bionomics and control of the pests of coconuts in Cochin State, together with brief descriptions of the various stages of the more important. These are *Oryctes rhinoceros*, L., *Rhyncophorus ferrugineus*, F., *Nephantis serinopa*, Meyr., *Contheyla rotunda*, Hmps. (outbreaks of which are sporadic), and *Parasa lepida*, Cram. Local parasites of *N. serinopa* include *Elasmus nephantidis*, Rohw., *Microbracon serinopae*, Cherian, *Apanteles taragamae*, Vier., and a Bethylid, which attack the larvae, and *Stomatoceras sulcatiscutellum*, Gir., and *Trichospilus pupivora*, Ferrière, which attack the pupae. *T. pupivora* is the most important.

KÔNO (H.). **Neue und wenig bekannte Ipiden als Schädlinge an Sachalintannen und Ezofichten in Hokkaido.** [New and little known Scolytids as Pests of *Abies sachalinensis*, *Picea jezoensis* and *P. glehni* in Hokkaido.]—*Insecta matsum.* **12** no. 2–3 pp. 64–73, 5 figs. Sapporo, March 1938.

Records are given of 25 Scolytids taken on *Abies sachalinensis*, *Picea jezoensis* or *P. glehni* in Hokkaido, with descriptions of three that are new species and notes on the distribution of the others.

KÔNO (H.). **Die Curculioniden, schädlich an Sachalintannen und Ezofichten.** [Curculionids harmful to *Abies sachalinensis*, *Picea jezoensis* and *P. glehni*.]—*Insecta matsum.* **12** no. 2–3 pp. 143–146, 1 fig. Sapporo, March 1938.

A list is given of 12 Curculionids taken on *Abies sachalinensis*, *Picea jezoensis* or *P. glehni* in Japan and Sakhalin, with records of other countries in which they occur. One new species is described.

INOUYE (M.). **On three Aphids of Lachninae from Hokkaido and Saghalien.**—*Insecta matsum.* **12** no. 2–3 pp. 74–80, 2 figs. Sapporo, March 1938.

Descriptions are given of the wingless viviparous female of *Stomaphis ulmicola*, sp. n., from *Ulmus propinqua*, and of the winged and wingless viviparous females, oviparous female and alate male of *Cinara shinjii*, n. n. (*Lachnus fasciatus*, Shinji nec Burm.) from *Pinus himekomatsu*, both in Hokkaido. *Cinara piceicola*, Cholod., is recorded from *Picea jezoensis* in Sakhalin.

WATANABE (C.). **On three Braconid Parasites of the Soy-bean Pod Borer, *Grapholitha glycinivorella* Matsumura (Contributions to the Knowledge of the Braconid Fauna of Manchoukuo, II).**—*Insecta matsum.* **12** no. 2–3 pp. 131–135 1 fig. Sapporo, March 1938.

The three Braconids here recorded from larvae of *Cydia* (*Grapholitha*) *glycinivorella*, Mats., in Manchuria, where it is a serious pest of soy beans, are *Chelonus pectinophorae*, Cushm. (*Chelonella nitobei*, Sonan), *Planerotoma planifrons*, Nees, and *Microdus glycinivorellae*, sp. n. ; description of both sexes of the last two are given.

Kalshoven (L. G. E.). **Invloed van insecten op de kwaliteit en verhandelbaarheid van indische landbouwproducten.** [The Effect of Infestation by Insects on the Quality and Marketability of agricultural Products in the Netherlands Indies.]—*Korte Meded. Inst. PlZiekt.* no. 24, 48 pp., 3 pp. refs. Buitenzorg, 1938. Price *Fl.* 0.50. (With a Summary in English.)

This paper is largely a survey of cases of damage by insects that have required attention at the Institute for Plant Diseases at Buitenzorg. One chapter is devoted to injuries to various parts of the living plant that cause a reduction in the quality or quantity of the crop, and another, mainly compiled from records since 1925, deals with infestations of stored products.

Browne (F. G.). **The Incidence of Ambrosia Beetle Attack on Poisoned and Girdled Trees.**—*Malay For.* **7** no. 2 pp. 77–86, 3 diagr. Kuala Lumpur, April 1938.

Differences in the incidence of ambrosia beetles on trees poisoned with sodium arsenite and girdled trees, as indicated by the results of this experiment, have a bearing on two practical problems in Malaya, namely the technique of killing trees prior to felling in order to render the timber flotable, and the preparation of trap-trees for the control of forest insects. The experiment was conducted in an even-aged (9-year) plantation of *Styrax benzoin* at Kepong. Of 30 trees (30–40 ft. in height and 5–6 ins. in diameter at breast height), 10 were poisoned with a 10 per cent. solution of sodium arsenite, 10 were poisoned with a 2·5 per cent. solution, and 10 were girdled by cutting into the stem all round to a depth of about 1 in. and a breadth of 4–5 ins. At the beginning of the investigation there was no source of infestation within the plot, but neighbouring plantations were full of slash that supported a fairly large population of ambrosia beetles.

Tables and graphs show the condition of the trees in terms of the percentages sickly, dead, and fallen (for each of the three treatments) and the degrees to which they were infested by ambrosia beetles at ten periodical inspections (varying from 1 to 47 weeks), the distribution of infestation at different heights from the ground, and the mean moisture contents of the trees at intervals during the first 12 weeks. These data are discussed. The heavily poisoned trees died very quickly, their condition after 2 weeks being roughly equivalent to that of the lightly poisoned trees after 4 months, and to that of the girdled trees after 7 or 8 months. The ambrosia beetles observed included *Platypus solidus*, Wlk., which was the dominant species during the early stages of the investigation, always on sickly or recently fallen trees, *Crossotarsus wallacei*, Thoms., which was also common in the early days of the experiment and persisted sporadically for some time, *P. cupulatus*, Chap., which was on the whole the dominant species throughout, although it was exceeded in abundance by other species at times, *P. lepidus*, Chap., which was fairly common throughout the investigation but was never abundant, and *Xyleborus mancus*, Bldf., which was very numerous at one stage on the branches of newly fallen trees. The girdled trees showed slight but steady attack, almost entirely confined to the region of the girdle, infestation increasing as the trees died. Poisoned trees showed very heavy attack on the whole length of the stem for several weeks, followed by a steady

decline, particularly when the stronger solution was used. The causes of the variations observed are obscure, but it is considered that fluctuations in moisture content may be an important factor. This is discussed with reference to its practical applications.

With regard to the technique of killing trees, the experiment indicates that girdling is preferable to poisoning, as the attack is confined to the region of the girdle, whereas in poisoned trees the whole stem is infested. With regard to the preparation of trap-trees, heavily poisoned trees attract the largest number of beetles during the first few weeks and would be most useful for direct control provided that they can be destroyed before the brood emerges. If, however, the trees are used to provide continuous breeding material for a limited population of insects [*cf. R.A.E.*, A **25** 645], girdling, or possibly poisoning with a very weak solution, would give the best results.

VINSON (J.). **Sur la présence de** *Perkinsiella saccharicida* **Kirkaldy à l'île Maurice.**—*Rev. agric. Maurice* no. 97 pp. 9–10, 5 refs. Port Louis, February 1938.

A few individuals of *Perkinsiella saccharicida*, Kirk., having been taken at light in Mauritius, a search of the sugar-cane fields was undertaken, and additional individuals and some eggs were found. They were not numerous, however, and the only injury observed was the red oviposition marks along the median vein.

Brief accounts are given of the extent of the damage caused by the leafhopper in Hawaii [*cf. R.A.E.*, A **3** 758] in 1904–06, of the introduction of natural enemies for its control [**9** 602 ; **24** 379, etc.], and of its bionomics from observations in Hawaii. A female lays about 300 eggs during a month or more, depositing 2–12 in each lesion. The nymphs hatch after 2–5 weeks or more and suck the sap of the sugar-cane. If the leafhoppers are very numerous, the canes suffer considerably from loss of sap, and the honey-dew exuded favours the development of sooty mould. *P. saccharicida* is also a vector of Fiji disease [**21** 520 ; **23** 265]. It is thought probable that it has been in Mauritius for several years and that it may have been checked by indigenous parasites. Many small Hymenoptera were observed in the fields, one of which resembles the Encyrtid, *Ectopiognatha* sp., that parasitises the leafhopper in Hawaii, and one of the leafhoppers appeared to have been attacked by a Dryinid.

FRAPPA (C.). **Les insectes nuisibles au manioc sur pied et aux tubercules de manioc en magasin à Madagascar.**—*Rev. Bot. appl.* **18** nos. 197–198 pp. 17–29, 104–109, refs. Paris, January–February 1938.

The two sections of this paper deal, respectively, with the principal pests of cassava [*Manihot utilissima*] in the field in Madagascar, and those of the stored tubers. Brief descriptions of most of the insects are given. Those attacking cassava in the field include termites, which sometimes destroy the newly planted cuttings, various Acridids, which feed on the leaves, and the Coccids, *Lepidosaphes* (*Mytilaspis*) *dispar*, Vayss., and *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.), which infest the stems and branches. *Saissetia* is seldom injurious, but *Lepidosaphes* so weakens the plants that their yield is considerably reduced. To check its spread, infested cuttings should not be used ;

lightly infested ones may be disinfected by being dipped in an insecticide such as lime-sulphur (2°Bé.). *Bemisia manihotis*, Frappa, is sometimes suspected of being the vector of cassava mosaic in Madagascar, but this has not been proved experimentally [*cf. R.A.E.*, A **26** 413]. Adults of the Dynastid, *Heteronychus plebejus*, Klug, attack the cuttings, and those of the Melolonthid, *Hyposerica* (*Serica*) *castanea*, Blanch., which were particularly injurious in 1930, feed at dusk on the leaf blades. The Curculionid, *Stigmatrachelus concinnus*, Boh., is abundant, and larvae and adults devour the parenchyma of the leaves. The leaves and the bark of the stems are attacked by the polyphagous Noctuid, *Prodenia litura*, F., which has 3–5 generations in the warm season in Madagascar.

The pests of stored cassava tubers are *Tenebrioides mauritanicus*, L., *Lophocateres pusillus*, Klug, *Ahasverus* (*Cathartus*) *advena*, Waltl, *Necrobia rufipes*, DeG., *Rhizopertha dominica*, F., which may be killed by exposure for 3 minutes to a temperature of 50°C. [122°F.], *Dinoderus bifoveolatus*, Woll., *Minthea obsita*, Woll., *M. rugicollis*, Wlk., *Sinoxylon conigerum*, Gerst., *Lyctus brunneus*, Steph., *L. africanus*, Lesne, *Tribolium castaneum*, Hbst. (*ferrugineum*, F.), *T. confusum*, Duv., *Alphitobius laevigatus*, F. (*piceus*, Ol.), *Calandra oryzae*, L., and *Araecerus* (*Araeocerus*) *fasciculatus*, DeG.

Stofberg (F. J.). **The Citrus Red Scale** (*Aonidiella aurantii* **Mask.**).— *Sci. Bull. Dep. Agric. S. Afr.* no. 167, 24 pp., 7 figs., 13 refs. Pretoria, 1937. Price 3*d*.

Aonidiella aurantii, Mask., the world distribution of which is briefly reviewed, occurs throughout South Africa, where it has been recorded from some 200 different food-plants and is the most important of the pests of *Citrus*. It also commonly causes serious injury to rose, pear, apple, guava, mulberry, privet and almond. It attacks the fruit, leaves, twigs and branches of all varieties of *Citrus*; the leaves turn yellow and drop off, the twigs and small branches then die back, and the entire tree may be killed in 2–3 years if the infestation is not controlled. On the fruit, the scales are so firmly attached that brushing machines will not dislodge them.

Studies on the life-history of the Coccid in the Transvaal were carried out on seedlings of sweet orange in pots in an open insectary. Details of the rate of reproduction, the duration of the various stages of development, and the effect of temperature on it are shown in tables and graphs. The females are viviparous. The crawlers (which may remain under the parent scale for a day or two in cold weather) usually travelled not more than 18 inches in search of a suitable spot to settle, and could not live without food for more than 24 hours. Their rate of movement increased with temperature, and at the highest tested (81°F.) they crawled 40 inches on smooth paper in an hour, but they could not make much progress on loose sand. Their dispersal is chiefly effected by such agents as birds, insects, and particularly wind. Of a total of 2,196 crawlers, 71·8 per cent. settled within 24 hours of being freed on leaves, and of 1,807 liberated in the course of a year, 61·9 per cent. became adult.

Females moulted for the second time about 43 days after settling, but males required 10–14 days more to complete their two larval instars and the prepupal and pupal stages. Embryonic development then lasted about 36 days, so that the life-cycle was completed in about

90, varying from 60 days in summer to 139 in winter. A female that was isolated on completing the second moult lived 5 months and 22 days without producing young ; it was then fertilised and produced 62 young in 43 days. This experiment confirms the conclusion that *A. aurantii* is not parthenogenetic [*R.A.E.*, A **22** 134]. The total number of young per female averaged 143 in summer and 69 in winter, the average numbers per day being 1·46 and 0·6 and the maxima 14 and 6. In winter, no young emerged for periods of up to 22 days in extreme cases, so that the reproduction period was much longer than in summer. In experiments, four complete generations and, at times, a partial fifth developed during a year, but all stages were continually found in the field.

Natural enemies, which are of little practical importance, include a parasite, *Aphytis chrysomphali*, Merc., *Lotis neglecta*, Muls., and other predacious Coccinellids, and the fungus, *Fusarium coccinellum*, which is found only on trees growing under very humid conditions. In South Africa, better results in control have been obtained by fumigating with hydrocyanic acid gas than by applying oil sprays, and this has been confirmed in comparative tests in the east and west of the Transvaal. In these experiments, the efficiency of various proprietary oil sprays varied greatly, and the maximum percentage mortality obtained with them was 91·8, which is not considered efficient control. Hydrocyanic acid gas at normal concentrations gave 98–99·9 per cent. mortality.

KAMAL (M.). *Brachymeria femorata* **Panz. (Hymenoptera-Chalcididae) a primary Parasite of the Cabbage Worm** *Pieris rapae* **L.**—*Bull. Soc. ent. Egypte* **21** (1937) pp. 5–12, 6 pls. Cairo, 1938.

Descriptions are given of the egg, five larval instars and pupa of *Brachymeria femorata*, Panz., a common parasite of the pupae of the cabbage butterfly, *Pieris rapae*, L., in Egypt. The adult Chalcids occur in the field from October to mid-April, but are numerous only from November to late February ; they have not been observed in the summer. In the laboratory, pairing took place a few hours after emergence and oviposition 2–3 days later. Unmated females produced male offspring. Under very favourable conditions, a female lays about 180 eggs. Very few eggs were deposited at temperatures below 14°C. [57·2°F.]. The optimum for oviposition appeared to be 20–24°C. [68–75·2°F.], and the females lived about 3 months at 20–22°C. [68–71·6°F.] and a humidity of 60–70 per cent. The eggs are usually deposited in the thoracic region of newly formed pupae, but larvae about to pupate were sometimes attacked. As many as 13 eggs have been found in one host, but only one larva is able to develop. Pupation occurs in the host pupa.

SHABETAI (C. R.). **Les préparations à base de nicotine employées en agriculture. Observations sur le dosage de la nicotine.**—*Bull. Soc. ent. Egypte* **21** (1937) pp. 47–55, 26 refs. Cairo, 1938.

This is an account, based on the literature, of ways in which insecticides containing nicotine are prepared, and of methods by which the amount of pure nicotine in them, and particularly in nicotine sulphate, may be ascertained.

Priesner (H.). **On the "Sugar Cane Thrips."** *Podothrips lucasseni* **(Krüg.), and some allied Species.**—*Bull. Soc. ent. Egypte* **21** (1937) pp. 68–81, 13 figs., many refs. Cairo, 1938.

The author describes both sexes of *Podothrips* (*Kentronothrips*) *lucasseni*, Krüg., from material collected from sugar-cane in Java, and quotes the original description. He considers that *Kentronothrips hawaiiensis*, Moulton, is identical with it, and that *Kentronothrips*, of which *hawaiiensis* is the type, is a subgenus of *Podothrips*. Three other species of *Podothrips* are also described, including *P.* (*Melampodothrips*) *oryzae*, subgen. et sp. n., from rice in Siam.

Cassab (A.). **La lutte contre la courtilière à l'aide d'appâts empoisonnés.**—*Bull. Soc. ent. Egypte* **21** (1937) p. 82. Cairo, 1938.

Zinc phosphide has been successfully used in poison baits for the control of mole-crickets [*Gryllotalpa*] in Egypt [*R.A.E.*, A **25** 96, etc.] but is rather expensive. Experiments have shown that barium fluosilicate, which costs less and is not so dangerous to use, is an effective substitute for it [*cf.* **23** 160].

Cassab (A.). **Les pièges lumineux et la courtilière.**—*Bull. Soc. ent. Egypte* **21** (1937) pp. 83–87. Cairo, 1938.

Tables are given showing the numbers of *Gryllotalpa gryllotalpa*, L., and *G. africana*, P. de B., captured in light-traps set up in infested fields containing various crops in Egypt in 1934. The traps do not appear likely to be of value for control, as few females were taken in them and none that contained eggs. Moreover, they caught no example of the brachypterous form (var. *cophta*, de Haan) of *G. gryllotalpa*, which is the commonest and most widely distributed mole-cricket in Egypt.

Kamal (M.). **The Cotton Green Bug,** *Nezara viridula*, **L., and its important Egg-parasite,** *Microphanurus megacephalus* **(Ashmead) (Hymenoptera-Proctotrupidae).**—*Bull. Soc. ent. Egypte* **21** (1937) pp. 175–207, 1 graph, 5 pls., 1 ref. Cairo, 1938.

Nezara viridula, L., the egg and nymph of which are described, attacks a great variety of economic plants in Egypt, but is seldom numerous enough to be injurious, as its eggs are heavily parasitised by *Microphanurus basalis*, Wollaston (*megacephalus*, Ashm.) [*cf. R.A.E.*, A **20** 106]. It is occasionally troublesome on cotton near the north coast, when the humidity is very high, as it then often disseminates the wound fungus, *Rhizopus nigricans*, which causes internal rot in the green bolls; and in 1937, near Cairo, the bugs migrated from a field of wheat, just before harvest, to a crop of tomatos, which became a total loss. The adults hibernate from November to March; they are most numerous in September. Oviposition begins 4–5 days after pairing and occurs from mid-March to mid-November. The number of eggs in each egg-mass varied from 3 to 202, with an average of 40–70 [*cf.* **22** 266, 446], and the incubation period lasted 4–8 days. From April to June, at a mean temperature of 26°C. [78·8°F.] and a relative humidity of 53 per cent., development was completed in 53–58 days. It is thought that there are 3 overlapping generations annually.

Descriptions are given of the immature stages of *M. basalis*, which also breeds throughout the summer. The ratio of males to females is

about 1 : 4. Males generally live 3–5 days with a maximum of 16. Pairing takes place directly after emergence, and the females oviposit in the host eggs as soon as they come into contact with them. When females kept in muslin cages constantly moistened with water, or in lamp glasses, and fed on sugar were given batches of host eggs at intervals of 2–4 days instead of having a continuous supply, the total number of eggs deposited was doubled and some of the parasites lived for nearly 3 months, even when the temperature averaged 31°C. [87·8°F.]. From April to July and from September to November, at average temperatures of 26·5 and 25°C. [79·7 and 77°F.] and relative humidities of 57 and 64 per cent., respectively, the numbers of eggs deposited daily by a single female averaged 50–60 and 116 (with a minimum of 80). As many as 6 eggs are sometimes laid in one host egg ; all may hatch, but only one larva develops to the second instar. At temperatures of 29·5 and 22·0°C. [85·1 and 71·6°F.] and relative humidities of 59 and 58 per cent., the life-cycle was completed in 9 and 18 days, respectively. It was prolonged by placing the host eggs in cold storage about 5 days after parasitism, good emergence being obtained after 12 days storage at 10–12°C. [50–53·6°F.]. The adult parasites should be kept at 15°C. [59°F.] and gradually transferred to 23°C. [73·4°F.] when they are needed for breeding. *Nezara* eggs kept at 6–8°C. [42·8–46·4°F.] for 47 days were successfully parasitised, but the parasites were unable to develop in eggs stored for 55 days at this temperature.

Notes are given on the introduction of the Scelionid into Western Australia [*cf.* **22** 446] and quotations from a letter dated July 1937 and received from L. Newman show that it is well established there, having survived 3 winters in the field, and has greatly reduced the damage caused by *N. viridula* in several areas [*cf.* also **25** 737].

Ghabn (Abdel Aziz Ali Elsayed). **Preliminary Results of Investigations on the Relation between the Attack of** *Prodenia litura* **Fabr. and** *Thrips tabaci* **Lind. on Cotton.**—*Bull. Soc. ent. Egypte* **21** (1937) pp. 233–265, 28 diagr. Cairo, 1938.

The observations described were made in the course of an experiment in Egypt on the control of *Thrips tabaci*, Lind., on plots containing different varieties of cotton planted on different dates, with a view to finding the effect of infestation by the thrips on subsequent infestation by *Prodenia litura*, F., chiefly as indicated by the number of egg masses in a given area. The results are shown in detail in graphs. In general it was found that infestation by *Prodenia* was more severe on cotton planted late, of which the leaves had not hardened. Infestation was also more severe where the earlier sown plants were in a similar condition owing to their growth having been retarded by infestation by the thrips. On all plots, infestation increased as a result of irrigation towards the end of June.

Pests and Diseases of the Carob Tree.—*Cyprus agric. J.* **33** pt. 1 pp. 27–28. Nicosia, March 1938.

Brief suggestions are made of possible methods of controlling the more important pests of the carob tree [*Ceratonia siliqua*] in Cyprus. These are *Aspidiotus hederae*, Vall., *Myelois ceratoniae*, Zell. (which attacks the fruits on the tree and in stores), *Cerambyx velutinus*, Brullé, and *Eumarchalia* (*Asphondylia*) *gennadii*, Marchal.

Schneider-Orelli (O.), Roos (K.) & Wiesmann (R.). **Untersuchungen über die Generationsverhältnisse der Fichtengallenlaus** *Sacchiphantes* (*Chermes*) *abietis*, **L.** [Investigations on the Interrelation of the Generations of the Spruce Gall Aphid, *Chermes abietis*.] —*Vjschr. naturf. Ges. Zürich* **83** pp. 29–107, 20 figs., 69 refs. Zürich, 8th March 1938.

Chermes (*Sacchiphantes*) *abietis*, L., occurs on spruce throughout Switzerland, producing the characteristic large "pineapple" galls, chiefly on trees 5–20 years of age. The investigation here described was made with a view to ascertaining whether *C. viridis*, Ratz., is a closely allied, but distinct, species or sub-species or whether the developmental cycles of the two forms merge from time to time. The world literature on the subject is reviewed, and an account is given of the holocyclic (*viridis*) and anholocyclic (*abietis*) cycles.

According to Dreyfus (1888–89), *C. abietis* has two parallel series, of which the first has a five-generation (*viridis*) cycle with a change of food-plant from spruce to larch, while the second has a two-generation (*abietis*) cycle on spruce. To test whether the branching into two cycles assumed by Dreyfus could really be proved, the studies were concentrated on the young produced on spruce or larch by large numbers of individual alates from spruce galls from different parts of Switzerland. Each alate was confined with either spruce or larch, but not with both at the same time. In the *abietis* cycle, the larvae from eggs laid by these alates have a proboscis twice as long as in the *viridis* cycle. It was found that, besides alates with uniform normal *abietis* young, there were alates of which the young, while predominantly corresponding to the *abietis* cycle, also included larvae with an intermediate length of proboscis and even larvae with a short proboscis. Such larvae were produced on both spruce and larch. Those with a short proboscis agreed completely with the neosistens stage in the *viridis* cycle, thus proving one of the branching points supposed by Dreyfus to exist. The transition from the *viridis* towards the *abietis* cycle was, however, less complete, as, though *viridis* alates reproduced on spruce and, in addition to typical young with a short proboscis, produced a few young with a proboscis of intermediate length on larch, they never gave rise to the young with a long proboscis characteristic of the *abietis* cycle.

These results show, at least for one point in the series of generations, that, while in the large majority of cases *abietis* and *viridis* reproduce consistently, this type of reproduction is not unchangeably fixed, and as they were supported by observed instability of morphological characters (pores of the nymphs, antennae of the alates and colour of the eggs), the author concludes that *abietis* and *viridis* are not independent species or even biological races, but simply represent two parallel development cycles of *C. abietis*.

Braun (R.). **Die Honigtaufrage und die honigtauliefernden Kienläuse (Cinarini C. B.).** [The Honey-dew Question and the Aphids (Cinarini) producing Honey-dew.]—*Z. angew. Ent.* **24** pt. 4 pp. 461–510, 4 pls., 3 pp. refs. Berlin, February 1938.

Divergent views on the way in which honey-dew is produced are reviewed from the literature, and a key is given to the commoner Central European species of the tribe Cinarini (comprising the genera *Eulachnus*, *Schizolachnus*, *Cinara* and *Lachniella*), which are the

chief Aphids concerned in its production, with a list of their food-plants and notes on the bionomics of some of them. Further lists are given of those that occur in Austria and of their parasites. The effect of biotic and abiotic factors on the abundance of these Aphids is discussed; their numbers are reduced by hot, dry summers, which are consequently bad seasons for honey-dew. There are about half a million colonies of bees in Austria, and they produce about 4½ million pounds of honey, much of which is obtained from honey-dew. This honey is darker than honey obtained from flowers and is largely used medicinally. As many honey-dew Aphids harm the plants they live on, any measures to increase production by favouring Aphids must necessarily be restricted to harmless species.

Lehmensick (R.) & Liebers (R.). **Beiträge zur Biologie der Mikrolepidopteren. (Untersuchungen an *Plodia interpunctella* Hb.)** [Contributions to the Biology of Microlepidoptera. (Investigations on *P. interpunctella*.)]—*Z. angew. Ent.* **24** pt. 4 pp. 582–643, 18 figs., 2 pp. refs. Berlin, February 1938.

Laboratory investigations on the biology of *Plodia interpunctella*, Hb., all stages of which are described, were made in Germany from July 1935 to August 1936 in connection with its control in a confectionery factory [*cf. R.A.E.*, A **24** 130]. The surface structure of the egg proved to be a differential character [**26** 196]. Development from egg to adult under warm, medium and cool conditions lasted 27, 110 and 305 days, respectively. At 12°C. [53·6°F.] egg development was usually suspended, and few of the eggs survived for more than 17 days, but those laid by moths from cold factory store-rooms (15–18°C. [59·0–64·4°F.]) were able to complete development at 12°C. The egg stage lasted only 1½–2½ days at the optimum temperature, between 27 and 30°C. [80·6–86°F.].

The young larvae wandered for a few hours. They never bored through closed containers from the outside, but were able to enter through the finest cracks. They survived for 56 hours without food and could develop in floor-dust; chemical analysis of such dusts showed them to contain substances rich in calories. Food-substances treated with Eulan [**24** 516, etc.] were eaten without ill effect, and the web spun by the larvae protected them effectively against dust poisons. When full-grown, they again began to wander, and at this stage they bit through obstacles, such as the foil wrappers of pralines, without feeding. Fabrics treated with Eulan were never touched by the fully grown larvae. The larvae finally spun cocoons in which they rested before pupating, pupation occurring only rarely without this diapause, which was the normal winter rest for the hibernating generation. The larvae were guided in their movements by a positive reaction to shadow, and light falling perpendicularly deprived them of orientation.

Adult emergence, pairing and oviposition are described at length. The newly emerged female could pair after about 2 hours, the male after 45 minutes. The total number of eggs per female varied from 157 to 309; the duration of adult life and number of eggs laid averaged 11 days and 301 at 18–22°C. [64·4–71·6°F], and 6 days and 217 at 29°C. [84·2°F.], the relative humidities being 40–50 and 70–80 per cent., respectively. As ovipositing females flew for some days, the capture of adults would be a more valuable measure than with the clothes moth [*Tineola biselliella*, Humm.]. Over half (54 per cent.) of the

eggs were laid within the first two days, but these eggs were scattered, and only about 75 per cent. hatched. From the third day onward, however, the females were distinctly stimulated to oviposit by substances suitable as food for the larvae, and nearly all the eggs of this ordered oviposition hatched. Glass, wood and chocolate did not attract the ovipositing females, and a simple coating of chocolate, if sufficiently thick, close and fresh, afforded great protection to fruit cubes, figs, and marzipan. The fruit cubes were the least protected, possibly because the chocolate coating had been applied some time previously, so that fruit scent substances may have dissolved in the cocoa butter and become perceptible outside. It is known that the tendency of *P. interpunctella* to infest pralines or almonds coated with chocolate is increasing, and it is now more harmful in confectionery factories in Germany than are *Ephestia* spp.

Hofmann (C.). *Cassida vittata* **Villers (glanzstreifiger Schildkäfer) als Rübenschädling in Bayern.** [*C. vittata* as a Beet Pest in Bavaria.] —*Z. angew. Ent.* **24** pt. 4 pp. 647–648, 2 figs. Berlin, February 1938.

An instance is recorded of a mass infestation in 1936 of a beet field in Bavaria by *Cassida vittata*, Vill. ; this beetle is common on beet in Italy, but is seldom abundant in Bavara.

Goffart (H.). **Zur Biologie und Bekämpfung von Tausendfüsslern.** [A note on the Biology and Control of Millepedes.]—*Anz. Schädlingsk.* **14** pt. 3 pp. 30–32, 1 fig., 7 refs. Berlin, 15th March 1938.

Cylindroiulus londinensis var. *teutonicus*, Poc., was observed attacking potato tubers in the Kiel district in July 1936, following a dry period, but in the summer of 1937, which was wet, this millepede could be found only on the decomposing roots of lucerne. In laboratory experiments, various seeds were attacked if sufficiently soft. A relative humidity of 45 per cent. inhibited feeding, but one of 80–90 per cent. was very favourable. Swollen wheat grains steeped in solutions of various poisons were rejected unless the millepedes were starved, and tests of soil treatment with sulphur and naphthalene gave no mortality, though some was caused by paradichlorobenzene.

Thalenhorst (–). **Raupenfrass an Weiden- und Pappelkulturen.** [Caterpillars damaging young Willow and Poplar Plantations.]—*Anz. Schädlingsk.* **14** pt. 3 p. 33. Berlin, 15th March 1938.

In June 1937, young willows and poplars in the district of Lindhorst, Prussia, were attacked by almost full-grown larvae of *Acronicta rumicis*, L., young larvae of *Dicranura vinula*, L., a few mature larvae of *Eudia* (*Saturnia*) *pavonia*, L., and unidentified Geometrids. The larvae had apparently migrated from *Vaccinium* growing nearby.

Zolk (K.). **Märkmeid kodumaa üraskite ökoloogia kohta II.** [Contributions to the Ecology of Bark-beetles II.]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 39 ; repr. from *Estländ. forstw. Jb.* **8** pp. 147–172, 14 diagr. Tartu, 1937. (With a Summary in German.)

The following is taken from the author's summary : This second part of a paper on investigations on the ecology of bark-beetles in

Estonia [*cf. R.A.E.*, A **24** 382] contains information on species infesting *Pinus sylvestris*. The logs were classified according to whether the predominant Scolytids infesting them were *Myelophilus* (*Blastophagus*) *piniperda*, L., *M.* (*B.*) *minor*, Htg., or a combination of *M. piniperda* and species of *Ips* of the subgenus *Pityogenes*. *M. piniperda* ordinarily infests only parts of the trunk that have a thick bark, the density of the infestation being proportionate to the thickness. It is the first species to bore in pine, and is followed by *M. minor*, *Ips* (*Pityogenes*) *quadridens*, Htg., and, lastly, *Ips* (*Orthotomicus*) *proximus*, Eichh. *M. minor* prefers sections with smooth bark on the lower part of the trunk, but sometimes infests parts covered with thicker bark. *Ips amitinus*, Eichh., *I. duplicatus*, Sahlb., and *I.* (*Pityogenes*) *chalcographus*, L., infest pine accidentally or if spruce is not available. *I.* (*P.*) *bidentatus*, Hbst., attacks chiefly the minor branches. Other species that infest the trunk and branches are *Hylastes* (*Hylurgops*) *palliatus*, Gyll., *Cryphalus abietis*, Ratz., *Polygraphus poligraphus*, L., and *Xyloterus lineatus*, Ol. The weevil, *Pissodes piniphilus*, Hbst., almost exclusively attacked the parts of the trunk that were covered with smooth bark.

Die landwirtschaftlichen Versuchsstationen der Universität Tartu. [The agricultural Experiment Stations of Tartu University.]—Demy 8vo, 64 pp., illus., Tartu, 1937.

These reports include one (pp. 32–41, 3 figs., 38 refs) from the entomological station, which is directed by K. Zolk, dealing with work carried out on insect pests in Estonia since 1921. Nearly all the insects mentioned have been noticed from separate papers [*R.A.E.*, A **12** 434 ; **13** 67, 68 ; **20** 185 ; **21** 310, 311 ; **22** 198]. An arsenical dust, applied before the flower buds appeared, was effective against the strawberry weevil, *Anthonomus rubi*, Hbst. In July 1936, *Cephus pygmaeus*, L., was recorded for the first time in Estonia, attacking wheat and rye.

Meikle (A. A.) & Macfarlan (J.). **Damage to Pasture by the Larvae of the Bracken-Clock.**—*Scot. J. Agric.* **21** no. 2 pp. 183–185, 6 refs. Edinburgh, April 1938.

In December 1937, larvae of *Anomala* (*Phyllopertha*) *horticola*, L., were found to be destroying the turf on an area of pasture, about two acres in extent, in southern Scotland. The grasses had been eaten just below ground level, and the damage was sufficiently bad to prevent the usual number of sheep being grazed ; bracken roots were not attacked. An examination in January 1938 showed that the neighbouring fields, to the extent of about 20 acres, showed some sign of attack, but the larvae were not so numerous in them. It is estimated that there were then nearly 435,000 larvae to the acre on the original area, not so great a density as that found by Walton in Somerset [*R.A.E.*, A **23** 631].

Petherbridge (F. R.). **Wireworms and Sugar-beet.**—*J. Minist. Agric.* **45** no. 1 pp. 23–27, 2 pls. London, April 1938.

In preliminary experiments carried out during 1936 in eastern England to find means of establishing the first sowing of sugar-beet in fields infested with wireworms, the best results were obtained by sowing wheat between the rows of beet. This method and the use of

greater quantities of beet seed were tested in 1937 in 6 fields. One only was sufficiently infested to allow of definite results. This field had been in grass up to 1935 ; in 1936, a crop of chicory was planted but was entirely destroyed by wireworms. In 1937, beet seed was sown on 30th April, 7 plots receiving, respectively, 15 lb. per acre plus bone superphosphate, 15 and 20 lb. per acre plus bone superphosphate and wheat between the rows, 20, 15 and 10 lb. per acre plus bone superphosphate, and 15 lb. per acre with no manure. The rest of the field received 15 lb. per acre plus bone superphosphate. On 17th May, the first 4 plots had, respectively, a thin stand, a fair stand without obvious damage, but wireworms in the wheat, an almost perfect stand with much damage to the wheat, and a patchy stand greatly damaged except for the first row, which had wheat on one side. The two remaining plots and the rest of the field had thin or very thin stands. On 20th May, the average numbers of wireworms in blocks 2 ft. long and 1 ft. wide dug between the rows in the third and fourth plots were 4·6 and 1·9, respectively, and the average numbers of seedlings per linear foot on the first four plots were, respectively, 4·21, 6·27, 21·95, and 7·47. On 27th May, the whole field, with the exception of the rows with wheat on one or both sides, was useless, and fresh seed was sown on 26th May, with wheat between the rows. This second sowing was only slightly attacked, but produced a variable crop, averaging 11 tons 5 cwt. 3 qrs. per acre. The variation, however, was not sufficient to account for the marked difference between the yields of plots receiving treatments 2 and 3, which were, respectively, 15 tons 7 cwt. 2 qrs. and 12 tons 19 cwt. 2 qrs. per acre. The crowding of the seedlings in plot 3 in the early stages probably accounts for the decreased yield.

In two other fields where a second sowing was made necessary by wireworm attack, the second crop was only slightly infested and satisfactory results were obtained even where no wheat was used.

Cann (F. R.). **An uncommon Type of Furniture Beetle Damage in Softwoods.**—*Builder* **154** pp. 654–655, 4 figs. London, 1st April 1938.

Notes on the distribution and brief descriptions of the adults, larvae and tunnels of *Ernobius mollis*, L., are given ; the complete life-cycle occupies about one year. This Anobiid occurs in dry seasoned timber on which the bark is still present and only infests softwoods. It does not attack living trees, green wood, or wood from which the bark has been removed, and is confined to the outer sapwood in the immediate vicinity of the bark. Injury is frequently found in fencing posts, pergolas and other rustic work made from unbarked coniferous timber. Instances are cited of infestation of structural timber in houses in Britain ; in such cases insecticide treatment is not necessary, as further damage can be prevented by the removal of the bark. The bark should be entirely stripped from softwood timbers before use and immediately burnt.

Petherbridge (F. R.) & Wright (D. W.). **The Cabbage Aphis (*Brevicoryne brassicae* L.).**—*J. Minist. Agric.* **45** no. 2 pp. 140–148, 2 pls., 2 refs. London, May 1938.

An account is given of the results of investigations carried out during 1933–37 in eastern England on the bionomics and control of

Brevicoryne brassicae, L., which attacks various important cruciferous vegetables. Much of the information obtained has already been noticed [*R.A.E.*, A **24** 548]. The Aphid was observed to overwinter only on Brussels sprouts, autumn and winter cabbage and cauliflower, and, except in mild winters, only in the egg stage. In 1937, new crops were infested by winged Aphids on 1st June, but not until late in June in an area about 50 miles distant where seeding plants were less abundant and infestation lighter. Larvae of a Cecidomyiid of the genus *Phaenobremia* preyed extensively on the Aphid in certain localities in 1937 and on some plants proved more effective than the Syrphid larvae present.

An atomised spray of pyrethrum extract in oil applied to infested broccoli in July 1937 destroyed the colonies on the leaves but not those in the hearts, and infestation of treated and untreated plants was similar after 3 weeks. Various control measures recommended [*loc. cit.*] include the growing of *Brassica* seed crops (especially Brussels sprouts) in alternate years only.

PAILLOT (A.). **Le cycle évolutif de** *Nosema carpocapsae*, **microsporidie nouvelle parasite du carpocapse** (*Laspeyresia pomonella* **L.**).—*C.R. Soc. Biol.* **127** no. 12 pp. 1138–1140. Paris, 1938.

A description is given of *Nosema carpocapsae*, sp. n., a microsporidian parasite of *Cydia* (*Laspeyresia*) *pomonella*, L., first observed in hibernating larvae in south-eastern France in 1936. It was again found in 1937, when the percentage of larvae parasitised was higher, and a study of its development was made. Multiplication, which can take place in most of the cells of the host, does not cause serious lesions. During the diapause of the larva, the parasites are found only in the state of spores. They spread chiefly as a result of transmission through the eggs of the host; they do not appear to be of importance for its control.

PAILLOT (A.). **Sur l'origine des cellules géantes des chenilles de** *Pieris brassicae* **et des aphides parasités par hyménoptères.**—*C.R. Soc. Biol.* **127** no. 14 pp. 1504–1506, 6 refs. Paris, 1938.

Investigations showed that the giant cells in larvae of *Pieris brassicae*, L., parasitised by *Apanteles glomeratus*, L., have their origin in the amniotic membrane that envelops the embryo of the parasite in the early stages of development [*cf. R.A.E.*, A **23** 550, etc.]. After the dissociation of the membrane, the cells become free in the blood, assume a regularly rounded shape and increase rapidly in size. The process of hypertrophy of the amniotic cells before their dispersal in the body-cavity was also observed in *P. brassicae*, and in *Psyllus* (*Chaitophorus*) *lyropictus*, Kessler, parasitised by *Aphidius ribis*, Hal. In both hosts the giant cells are present until the end of the larval life of the parasite, which finally consumes them.

GEIJSKES (D. C.). **Waarnemingen over het fruitspint in verband met zijn bestrijding.** [Observations on the Fruit Tree Red Spider in Connection with its Control.]—*Tijdschr. PlZiekt.* **44** pt. 2 pp. 49–80, 18 figs., 2 graphs, 31 refs. Wageningen, 1938.

Observations were made in Holland in 1937 on the development on apples of the fruit-tree red spider, *Paratetranychus pilosus*, C. & F.,

for which the author considers the correct name to be *Metatetranychus ulmi*, Koch. The mite, which also attacks plum and cherry, is difficult to control, as its eggs are resistant to tar distillates and some other winter insecticides.

The classification and synonymy of the mite are discussed, all stages are described and the adults figured, and its world distribution and 24 recorded food-plants are noted. The winter eggs are laid in cracks, etc., on twigs, and the larvae hatch at the end of April or early in May, and at once migrate to the young leaves. Breeding continues on the foliage throughout the summer. The author observed 5 generations from early May to mid-October. The first three developed rapidly in the presence of abundant food, but individuals of the fourth generation began to disperse when food became scarce owing to leaf-fall. At first only summer eggs were laid, mainly on the underside of the leaves, but deposition of the winter eggs on the woody parts began at the end of July or early in August, and was apparently correlated with lack of food. The males and most of the immature individuals occurred on the underside of the leaves, while the females fed preferably on the upper leaf surface. The injury caused to the leaves by the sucking of the mites is described; the chlorophyll cells mainly supplied the nourishment, the chlorophyll being dissolved by enzymes and ingested in liquid form. Observations on the effect of temperature and humidity showed that development began at an average of 15° C. [59° F.]. The optimum humidity was about 70 per cent. It would appear that there is a risk of serious infestation in July and August if the weather is favourable in May and there are no marked set-backs in June.

Stethorus punctillum, Weise (*Scymnus minimus*, Rossi) and *Anthocoris nemorum*, L., were predacious on the mites and considerably reduced their numbers, although they did not appear until mid-summer, when the infestation was already advanced. *P. pilosus* is known to be a more serious pest in countries, including Holland, where tar-distillate sprays are applied in winter [*cf. R.A.E.*, A **17** 501, etc.] and the author suggests that as *S. punctillum* and *A. nemorum*, of which the hibernating adults are killed by these sprays, also prey on mites on narrow-leaved willows, which are not infested by *P. pilosus*, the biological control of the latter may be furthered by planting these willows near orchards and leaving them unsprayed. Summer measures against all stages are advocated until a satisfactory means for destroying the winter eggs is found. Sprays are preferred to dusts and should be applied against the first three generations to prevent injury to the leaves, varieties of apple most susceptible to attack and therefore foci of infestation being treated as quickly as possible. Hedges of dog-rose or hawthorn near orchards must also be sprayed.

Bosma (B.). **Spintbestrijding bij vruchtboomen.** [The Control of Red Spider on Fruit Trees.]—*Tijdschr. PlZiekt.* **44** pt. 2 pp. 81–102, 12 refs. Wageningen, 1938.

This is an account of comparative tests made in fruit-tree nurseries in Holland by A. W. van de Plassche in 1933–35 and subsequently by the author with 28 insecticides against *Paratetranychus pilosus*, C. & F. (*Metatetranychus ulmi*, auct.) on apple, plum and cherry. Except in one instance, the experiments were made in winter against the eggs. Mineral oil emulsions were the chief insecticides tested,

but carbolineum (tar distillate), California mixture (lime-sulphur and salt), mixtures of carbolineum and mineral oil, and some proprietary preparations of unspecified composition were also tried [*cf.* *R.A.E.*, A **23** 157].

The results, which are tabulated, are summarised as follows: The best control was obtained with 7–10 per cent. emulsions of good mineral oils unmixed with carbolineum. They should be applied in the first half of March; spraying at an earlier date may cause injury. California mixture, applied soon after mineral-oil emulsion, may cause severe injury; at least 4 weeks must elapse between the two applications. In all the tests, the mixtures of mineral oil with carbolineum were much inferior to good mineral oils alone, but the latter were not effective against Aphids. Contrary to observations in England [**17** 501], carbolineum slightly reduced infestation by *Paratetranychus*. Bordeaux mixture was quite ineffective. California mixture was not sufficiently effective in winter, but gave some control in summer, on apple, pear and plum.

LEEFMANS (S.). **De draaihartigheid der kool I–II.** [Deformed Heart of Cabbage I–II.]—*Meded. Tuinb.-Voorlichtingsdienst* no. 1, 28 pp., 3 pls., 1 chart; no. 5, 42 pp., 1 chart, 6 refs. The Hague, 1937–38.

Deformed heart of cabbage and cauliflower due to infestation by *Contarinia nasturtii*, Kieffer (*torquens*, de Meij.) has caused considerable losses in northern Holland since it was first observed in 1897. The author has investigated the bionomics of the midge and the possibilities of controlling it [*cf.* *R.A.E.*, A **25** 640].

The first paper contains a full account of the work done in 1936. To obtain exact information on the dates of adult flight, the author devised an emergence cage, of which several were placed on the soil at the end of May. It had wooden sides and a wire gauze top. It could be darkened by a cover, and the midges then entered a test-tube inserted in one side, which was the only source of light. Females were very inactive below 20°C. [68°F.]. Warm, rainy weather preceded the first main flight in the second half of June [*cf.* **19** 274], which resulted in considerable injury. The second main flight in the last three weeks of July, was accompanied by cold, gloomy weather, and the plants recovered surprisingly well, owing to the effect of the temperature on the midge rather than on the plants, for, in spite of the wet weather, there was very little of the rot that follows infestation by *C. nasturtii*. Females matured 66–124 eggs and deposited batches of 4–48 on at least 3–5 plants. The eggs were laid either between the young leaves and the axil of the opposite large leaf or on the unopened young leaves. The egg, larval and pupal stages lasted 3–5, 15–24 and 6–7 days, respectively, in summer [*cf.* **19** 275]. The effects of infestation were visible 2–5 days after the larvae hatched. Growth was checked and the stems of the young leaves swelled and twisted, forming galls containing moisture in which the larvae lived. On maturing, the larvae entered the ground and pupated in silken cocoons.

The various control measures tried in Holland and other countries are briefly reviewed from the literature, and notes are given on laboratory experiments made as a basis for field work in 1937. The adults were found sensitive to derris and pyrethrum dusts. Cultural measures are discussed, and it is stated that in one district uninfested cauliflowers

were raised when seedlings free from eggs were planted out after the first flight of *C. nasturtii* had ended. Cultivating the soil reduced adult emergence.

The second paper contains a detailed account of work done in 1937, including investigations on larval feeding. Parts of plants were never found in the larval intestine, which was shown to have no outlet. The larvae appeared to feed exclusively on fluids. The larvae of the overwintering generation hibernated in their cocoons and pupated in spring. About 90 per cent. of the cocoons in summer and 94 per cent. of those in winter were in the upper two-inch layer of soil. Some of the larvae underwent a diapause, remaining in the cocoons for a year. Adults appeared in August 1936 and July 1937, from pots of soil in which larvae pupated in July 1936; these pots are being kept under observation in case of further emergence. The occurrence of a diapause increases the importance of disinfesting seedling trays. In submersion tests, normal adults emerged after the larvae had been kept under water for 3 months, so that flooding can have little effect on *C. nasturtii*; pupation is merely delayed. Counts of the horizontal distribution of the cocoons in the ground showed that for reliable forecasting it is necessary to use several emergence cages. Adults were able to emerge from a depth of 12 inches in loose, sandy soil. Twice as many adults emerged from soil turned in March as from that turned in January. Males lived for 1 day and females for up to 3 days, when confined among the plants.

Many insecticides were again tested, some giving satisfactory control in the field as judged by the condition of the plants. From the results, the author recommends 0·1 per cent. nicotine and 1½ per cent. soap for headed cabbage, and 2 per cent. pyridine and 1½ per cent. soap for cauliflower. Headed cabbage must be sprayed twice a week, while in slight infestations of cauliflower one application weekly may suffice. Derris may be recommended as a dust insecticide, but spraying with a strong jet is more effective, as it tends to wash away both larvae and eggs.

Standard Method of Control of the Colorado Beetle (*Leptinotarsa decemlineata*).—*Int. Bull. Pl. Prot.* **12** no. 4 pp. 76M–78M. Rome, April 1938.

Decisions and Recommendations of a Technical Order adopted at the IIIrd Conference of the International Committee for the Mutual Study of the Control of the Colorado Beetle (*Leptinotarsa decemlineata*).—*T.c.* no. 5 pp. 99M–100M. May 1938.

Delegates from Germany, Belgium, France, Italy, Luxemburg, the Netherlands, Switzerland and the International Institute of Agriculture participated in this Conference held at Zürich, in March 1938, on the control of *Leptinotarsa decemlineata*, Say, on potato. A programme of control measures is given; they are substantially the same as those already noticed [*cf. R.A.E.*, A **26** 418, etc.]. In an infested or suspected area, examination of plants should be intensified as soon as the soil temperature exceeds 10°C. [50°F.], the optimum temperature for the emergence of adults being 14–15°C. [57·2–59°F.]. It should be extended to all areas on which any solanaceous plants are growing and becomes all the more necessary when the temperature exceeds 20°C. [68°F.] for several days. It should follow the direction of the wind prevailing during the hottest hours of the day (10 a.m. to 3 p.m.).

The green foliage should be retained as late as possible into the autumn and potatoes replanted as early as possible in the spring on the infested areas to serve as trap-plants. Standardised terminology and symbols for the mapping of the infested areas are enumerated and defined in the second report.

ZACHER (F.). **Haltung und Züchtung von Vorratsschädlingen.** [The Maintenance and Breeding of Pests of Stored Products.]—*Abderhalden, Handb. biol. Arbeitsmeth.* Abt. IX, Teil 7, Heft 3 (Lief. 416) pp. 389–592, 196 figs. Berlin & Vienna, Urban & Schwarzenberg, 1933. [Recd. 1938.]

This work is designed to encourage the biological study of pests of stored products. A brief section (pp. 390–399) contains general remarks on the conditions necessary for breeding them, together with descriptions of apparatus that the author has found useful. In the major section (pp. 399–592), he briefly describes a large number of Coleoptera, Lepidoptera, Diptera and mites that infest stored products, structural timber, etc., giving in each case notes on distribution, habitat, bionomics, parasites and factors affecting development. Suitable breeding methods are indicated, and a bibliography is given for each family and the more important species.

BOVIEN (P.). **Die Maikäferfrage in Dänemark.** [The May Beetle Question in Denmark.]—*Z. PflKrankh.* **48** pt. 4 pp. 178–179. Stuttgart, 1938.

Records of the occurrence of *Melolontha melolontha*, L. (*vulgaris*, F.) in Denmark since about 1870 are briefly surveyed. It is distributed throughout the country, whereas *M. hippocastani*, F., is restricted to Jutland. It is now becoming more prevalent, and measures against it are the subject of much discussion. It is generally held that energetic organised collection must reduce its abundance.

ECKSTEIN (F.). **Die Engerlingsplage in Vorpommern.** [The Pest of Cockchafer Larvae in western Pomerania.]—*Z. PflKrankh.* **48** pt. 4 pp. 179–199. Stuttgart, 1938.

Melolontha melolontha, L., has been increasing in abundance in western Pomerania and adjoining parts of Germany during the past ten years and has caused serious crop losses over extensive areas. With a view to an organised collection of adults in 1938, a preliminary survey of the local distribution and frequency of infestation in the soil was made from April to September 1937. The population is somewhat reduced by birds and fungous disease. It is concluded that too little is known of the factors affecting the development of the beetle for rational control, and that collection must be regarded as merely an emergency measure.

HASE (A.). **Schäden und Missbildungen an Möhren als Folge von Tausendfussfrass.** [Injuries to and Deformations of Carrots due to Attack by Millepedes.]—*Z. PflKrankh.* **48** pt. 4 pp. 201–208, 6 figs., 13 refs. Stuttgart, 1938.

A detailed account is given of an infestation of carrots in a garden near Berlin by millepedes, including *Cylindroiulus londinensis* var. *teutonicus* Poc., *C. oweni*, Bollman (*frisius*, Verh.) and *Nopoiulus* sp. The carrots were badly deformed and suffered a great loss in weight.

Weidner (H.). *Phosphorus gabonator* **Thoms. als Kakaoschädling und einige Bemerkungen über weitere schädliche** *Phosphorus*-**Arten (Col., Ceramb. Lamiin.).** [*P. gabonator* as a Pest of Cacao and some Notes on other harmful Species of *Phosphorus*.]—*Z. PflKrankh.* **48** pt. 4 pp. 210–223, 5 figs., 24 refs. Stuttgart, 1938.

Cacao branches from a plantation in the British Cameroons were found in Hamburg to be infested by larvae of the Lamiid, *Phosphorus gabonator*, Thoms., which has not hitherto been recorded as a pest of cacao, but was stated by Brick in 1908 to be injurious to *Cola nitida* in the Cameroons. The genus *Phosphorus* and its 8 species are briefly described, and the synonymy and distribution of the latter are given, together with notes from the literature on damage caused by some of them. Descriptions are also given of the larva and pupa of *P. gabonator* and its larval tunnels. The author quotes part of the report sent to him from the plantation, from which it appears that females emerge at the end of June or early in July and oviposit in young shoots of cacao or kola after cutting off the tips. The larva mines the soft wood of the shoot and on reaching the fork it tunnels towards the trunk, working in spirals in the hard wood. It penetrates the trunk of trees 4–5 years old and sometimes kills them. At the end of the dry season (February-March), pupation takes place in the tunnels. An adult removed by the author from its pupal chamber on 14th July 1937 lived until 2nd August; it was not seen to feed.

Annual Report on the Working of the Department of Agriculture (Malta) during 1936–37.—77 pp. Malta, 1938.

It is reported (pp. xxxvii–xxxviii) that the experiment on the control of the mole cricket [*Gryllotalpa gryllotalpa*, L.] attacking vegetable seedlings in Malta [*R.A.E.*, A **25** 651] was repeated during 1936–37. The results, however, were still inconclusive.

A. de Nardo reports (pp. lx–lxiii) that an exceptionally late generation of *Phthorimaea operculella*, Zell., the most serious pest of potatoes, attacked the winter crop. This was attributed to early rains, followed by rather high temperature. Other pests observed included *Pseudococcus* (*Dactilopius*) *vitis*, Nied., which was very injurious to vines in a few localities, *Ceratitis capitata*, Wied., which was more abundant than usual, particularly on *Citrus*, *Dacus oleae*, Gmel., which was unchecked in the few remaining olive-yards and greatly injured the crop, several species of Coccids on *Citrus*, *Eriosoma lanigerum*, Hsm., which was well controlled in all apple orchards by *Aphelinus mali*, Hald. [*cf.* **24** 800], *Capnodis tenebrionis*, L., and *Cerambyx miles*, Bon., in the trunks and stems of various fruit trees, and *Zeuzera pyrina*, L., in the branches of pear and apple.

McKenzie (H. L.). **The Genus** *Aonidiella* **(Homoptera ; Coccoidea ; Diaspididae).**—*Microentomology* **3** pt. 1 pp. 1–36, 16 figs. Stanford Univ., Calif., March 1938.

The author briefly discusses the divergent views of various workers on the status and scope of the genus *Aonidiella* and gives a list of the species that have at any time been referred to it, either as a subgenus or as a genus, and a list of 16 species, one of which is new, that in his opinion are so referable. He distinguishes *Aonidiella* from *Aspidiotus*

and *Chrysomphalus* by the sclerotisation and enlargement of the prosomatic region and the tendency toward the development of the prosomatic lobes. In addition, it may be separated from *Aspidiotus* by the absence of the paraphyses in the latter genus. He regards the absence of the perivulvar pores (one of the characters on which *Aonidiella* was originally based) as of no significance as a generic character, its acceptance as significant being one of the chief reasons why others have included a heterogeneous group of species in the genus. Among the species that should not be referred to it are *Chrysomphalus* (*Aspidiotus*) *personatus*, Comst., and *Aspidiotus perniciosus*, Comst.

The food-plants, distribution and characters of the species that the author considers to belong to *Aonidiella* are given, and 13 of them are figured. A key to the species is included, and a discussion by G. F. Ferris of the geographical distribution of the genus is appended and illustrated by a map showing its probable natural range and the type locality of each species.

Summary of the Scientific Research Work of the Institute of Plant Protection for the Year 1936. Part II. Pests and Diseases of industrial and Fruit Crops. [*In Russian.*]—Roy. 8vo, pp. 253–444, 18 graphs, 13 diagr., 22 figs., 4 refs. Leningrad, Lenin Acad. agric. Sci., 1937. Price 6 *rub.* 50 *kop.*

This part [*cf. R.A.E.*, A **26** 422] comprises summaries of reports of work in the Russian Union on pests and diseases of cotton (pp. 255–295), beet (pp. 296–328), clover and flax (pp. 329–358), hemp (pp. 359–374) and fruit trees (pp. 375–439). The following summaries deal with pests.

Ugarov (A. A.). **Species of Tetranychidae in Soviet Central Asia** (pp. 256–257). Examinations in 1935 and 1936 of 52 species of plants in Central Asia revealed the presence of one new genus and six new species of Tetranychid mites. A list of these is given, showing that the new genus and five species were described by Ugarov and Nikol'skiĭ in 1935 and the sixth species by Ugarov in 1936, but the publications in which the descriptions appeared are not stated. The most abundant of the mites was *Tetranychus* (*Eotetranychus*) *turkestani*, Ugar. & Nik.; it occurred on all the 52 species of plants examined and represented 88·2 per cent. of all the mites found and 99·4 per cent. of those found on cotton [*cf.* **25** 146].

Vasser (R. E.). **Influence of Air Temperature and Humidity on the Multiplication of the Cotton Red Spider** (pp. 257–259). In the experiments described, a polyphagous species of red spider [*Tetranychus*], which had initially been collected on cotton in Armenia, was reared on beans. The life-cycle was completed in the shortest time (6·5–7 days) at 33°C. [91·4°F.] and 30–65 per cent. humidity, or at 35·4°C [95·72°F.] and 38–50 per cent. Development was somewhat retarded at higher temperatures, greatly retarded at 16–17°C. [60·8–62·6°F.], and stopped completely at 14–15°C. [57·2–59°F.]. At 30°C. [86°F.], the duration of development was little affected by changes in humidity between 25 and 80 per cent., but it was markedly prolonged at 90 per cent. humidity. At temperatures above 30°C., it was prolonged at 80 per cent. humidity. The average number of eggs laid per day increased from 8 at 21·5°C. [70·7°F.] to 14 at 33°C.

[71·4°F.] and decreased sharply at higher temperatures. It also decreased when the humidity was high (80 per cent. or more at temperatures between 21·5 and 30°C. and 65 per cent. or more at higher temperatures). At 55°C. [131°F.] and 90–95 per cent. humidity, 25–30 per cent. of the eggs were killed. Development and fertility were little if at all affected by low humidity (25 per cent. at 21–31°C. [69·8–87·8°F.]). Development was rapid, fertility high and mortality low at about 30°C. and a humidity of 35–55 per cent.

Shek (G. Kh.). **The Rôle of Forage Plants in the Multiplication of the Red Spider** (pp. 259–260). Laboratory experiments in Transcaucasia at temperatures of 25–31°C. [77–87·8°F.] and humidities of 48–65 per cent. showed that the fertility of the red spider [*Tetranychus*] infesting cotton varies with the food-plant. The total number of eggs laid by females bred on clover, beans, *Convolvulus* and violets averaged 86, 53, 30 and 17, respectively. Females on American cotton were considerably more fertile than those on Egyptian cotton, which is less readily attacked, and the number of eggs deposited also varied with the different varieties. Females on cotton usually lived longer than those on other plants. It is concluded that crop rotation and selection of certain varieties of cotton would reduce the abundance of mites in the spring and check their activity in summer.

Goritzkaya (O. V.). **Conditions increasing the Effectiveness of Sulfur against the Red Spider** (pp. 260–262). Laboratory experiments in Central Asia showed that the toxicity of sulphur dusts to the red spider [*Tetranychus*] attacking cotton increased with temperature, irrespective of humidity. The percentage mortality of the mites was 0–11·2 at 27°C. [80·6°F.], 60·0–98·7 at 35°C. [95°F.] and 100 in all tests at 40°C. [104°F.]. The rate of application of the dust was of hardly any importance provided that it came in contact with the mites, but if it was separated from them by a distance of as little as 1·5 mm. it gave only 33·5 per cent. mortality in two hours at 40°C. Thorough dusting of the lower surface of the leaves is therefore essential. Of the preparations tested, ground sulphur remained effective during the whole period of the experiments, which lasted 30 days, but finely divided sulphur in combination with marl and a lime-sulphur spray began to lose toxicity 15 and 10 days, respectively, after application. The active principle of the lime-sulphur spray is in the colloidal sulphur given off in the process of decomposition, since all the mites were killed when placed on the leaves 24 hours after spraying, when the hydrogen sulphide had evaporated and only a thin layer of the colloidal sulphur remained. Special experiments showed that the mortality of the mites depends on their rate of respiration. The yellow (summer) form of the mite consumed 4·1 times as much oxygen in an hour at 35°C. [95°F.] as the red (hibernating) form; and in experiments under identical conditions, the red and yellow forms showed 16·5 and 65·7 per cent. mortality, respectively.

Goritzkaya (O. V.). **Waste Lye as an Acaricide** (pp. 262–264). A waste lye produced in the manufacture of cotton-oil soap was tested in sprays against the red spider [*Tetranychus*] on cotton in field experiments in various parts of Uzbekistan. It gave 48·5–99 per cent. mortality and was more effective than sulphur dust. In the laboratory, 8 per cent. solutions killed all the mites. The lye is effective at a temperature as low as about 20°C. [68°F.]. It is composed of

water, sodium hydroxide, sodium carbonate, sodium chloride, salts of fatty acids, glycerine, resins, etc., the proportions of which depend on the process of boiling of the soap. In experiments in which some of the components were tested separately, they did not give such high mortality as the waste lye itself.

Zhuravskaya (S. A.). **Relative Toxicity of Mineral Oil Emulsions as Ovicides for *Eotetranychus turkestani* Ugar. et Nick.** (pp. 264–265). In laboratory experiments in Central Asia, emulsions of solar oil killed fairly high percentages of the eggs of *Tetranychus* (*Eotetranychus*) *turkestani*, Ugar. & Nik., on cotton leaves. Emulsions of solar distillate were rather less effective.

Ismailov (A.). **Experiments with Mineral-Oil Emulsions for the Control of Red Spider and Aphis on Cotton** (pp. 265–267). In field experiments in Azerbaijan, four preparations, the composition of which is not given but which chiefly consisted of waste products of oil distilleries, applied in sprays against the red spider [*Tetranychus*] on cotton killed considerable numbers of the eggs. The leaves were only slightly scorched. These sprays also gave good results in tests against the cotton aphis [*Aphis gossypii*, Glov.].

Kozhanchikov (I. V.). **Effect of Temperature on the Development of the Boll Worm Pupa** (pp. 267–268). In laboratory experiments at a relative humidity of 60 per cent., the temperature-sum necessary for development of pupae of the cotton boll-worm [*Heliothis armigera*, Hb.] was about 170 day-degrees C. [306 F.]. The average duration of development of pupae of the hibernating generation varied from 36·4 days at 20·4°C. [68·72°F.] to 11·1 days at 34·8°C. [94·64°F.]. The threshold of development was about 17·5°C. [63·5°F.], at which a small percentage of the pupae gave rise to adults. At an average of 15°C. [59°F.], no adults emerged during 8 months, though the pupae did not die. The threshold of development of the pupae of the summer generation (which pupated at 27–28°C. [80·6–82·4°F.]) was 14–15°C. [57·2–59°F.]; at this temperature only a few adults emerged and many of them were deformed. The duration of the development at different temperatures was similar to that of pupae of the hibernating generation. Females from pupae that had been kept at optimum temperatures sometimes laid over 3,000 eggs, whereas those from pupae kept at a high or low temperature laid only a few dozen eggs or were sterile.

Pyatnitzkiĭ (G. K.). **Temperature Régime of Crops used in Rotation with Beets as a Factor in stationary Distribution of some harmful Insects** (pp. 303–308). To determine whether temperature is the factor that causes the adults of *Loxostege sticticalis*, L., and *Euxoa segetum*, Schiff., to congregate at night and oviposit chiefly on plots with low and sparse vegetation, investigations were carried out in the Province of Kiev from 1st June to 1st October 1936 on the minimum night temperatures in fields under different crops used in rotation with beet. For this purpose, thermometers were placed on the surface of the soil and fixed at heights of 10, 20, 40 and 60 ins. The results are given in a table showing the crop concerned, the height of the vegetation, the average minimum temperature of the air at the various levels, and the difference from the minima in fallow plots devoid of vegetation. It was found that the minimum temperatures in fallow

plots gradually rise as the distance from the soil surface increases, but those in plots in which crops are growing are lowest at some distance above the soil, the distance increasing in proportion to the height and density of the vegetation. As compared with the cultivated plots, the temperatures in the fallow were much lower on the soil surface, but were much higher at and above the 10-inch level. After the harvest, the temperature conditions of the cultivated plots approached those of the fallow ; on the whole, warm conditions prevail then, whereas in the spring only fallow and beet fields are warm. The night temperature minima also depend partly on the relief of the soil. In calm and clear weather, differences due to vegetation and relief are sometimes as great as 8–9°C. [14·4–16·2°F.] even in adjoining plots. Since the most active migrations of the two moths take place in the evening and the first half of the night during such weather, and since they are chiefly directed towards areas with sparse and low vegetation, it is concluded that these migrations, as well as the selection by the moths of places for a lengthy sojourn and oviposition, depend on the temperature.

Pyatnitzkiĭ (G. K.) & Medvedeva (V. I.). **Distribution of the Beet Weevil on Crops used in Rotation with Beets** (pp. 308–313). To investigate the distribution of the beet weevil [*Cleonus punctiventris*, Germ.] in different cultivated fields in the province of Kiev, samples of soil taken from an area of about 9,880 acres were examined for the presence of overwintered adults in May and for the larvae and pupae in June. In the autumn, samples were examined from about 123,500 acres in another district. The results showed that the overwintered weevils concentrate in new plantations of beet in spring. Fields under crops used in rotation with beet only serve as habitats for a short period, unless they are overgrown with weeds, in which case the weevils are comparatively abundant. This distribution of the weevils is due to the practical absence of suitable food except in the beet plantations. A sharp reduction in infestation was observed in beet fields that had been resown, probably owing to the destruction of the eggs and larvae and to the migration of the adults to adjoining plots after they had devoured the previous crop. Infestation of medium intensity occurred in some fields where there were weeds, but was very slight in unbroken land, as the compact soil hindered oviposition and the penetration of the larvae, and in fields under winter crops, as the vegetation was rather tall in the spring and hindered the access of the weevils to the weeds. From these observations it is concluded that the beet plantations of a given year serve as the chief source of the weevils in the following year. It is sufficient, therefore, when determining the abundance of the hibernating weevils, to examine samples of soil from fields under beet.

Vuirzhikovskaya (A. V.). **Stationary Distribution of Moths of the Beet Noctuid** (pp. 313–315). Daily counts of the adults of *Euxoa segetum*, Schiff., caught in pans containing molasses baits placed in various fields in the province of Kiev during the flight of the two successive generations in June and from 15th July to 15th September showed that the numbers of moths decrease in proportion to the density and height of the vegetation. In June, the moths concentrate chiefly in plots under beet or clover, and in fallow land. In July–September, on the contrary, they are more dispersed, as many crops used in rotation with beet have been harvested and the

attractiveness of beet fields, which then have a comparatively dense and tall vegetation, is greatly reduced. It was also found that the numbers of moths were small in low-lying places, such as meadows, and as a result, the second-generation larvae were always most abundant in the upper part of the slopes near watersheds. The most intense flight took place at 10–11 p.m. on calm clear nights ; strong winds, mist, and especially rain, sharply reduced the numbers of the moths on the wing.

Larchenko (K.). **Anatomy and Histology of Maturation and Reproduction in the Moth,** *Loxostege sticticalis* (pp. 316–318). Investigations on *Loxostege sticticalis*, L. [*cf.* **25** 702] have shown that a reserve of fat is formed during the larval stage ; as soon as feeding stops and during the pupal stage, fatty-albuminous deposits are formed in the fatty tissue, which pass into the resultant adults. The latter do not develop any additional fat-body that would prompt the maturation of the eggs [*cf.* **25** 140]. Supplementary feeding in itself also does not provoke egg-maturation ; the latter is only possible when the fat-body is dissolved as a result of supplementary feeding and is thus used up. This explains the fact that moths given water only are able to lay more eggs than those kept on a sugar diet. In the larvae, the fat-body does not develop equally under identical conditions of temperature and humidity. The resultant adults will, therefore, have different amounts of fat-body. As a rule, the only moths that emerge are those that have a reserve of fat and are therefore able to lay eggs, but on rare occasions very small moths are sterile owing to the small reserve of fat-body, which they use up in the first days after emergence. Examination of the ovaries and fat-body of a large number of females of three generations taken in the field showed that maturation is possible at temperatures within the limits of 15–17 and 30–32°C. [59–62·6 and 86–89·6°F.], provided that the relative humidity is not less than 55–60 per cent. At average temperatures of 30–31°C. [86–87·8°F.], 25–30°C. [77–86°F.], 20–25°C. [68–77°F.] and 17–20°C. [62·6–68°F.], maturation requires 2–3, 3–5, 5–7 and 7–10 days, respectively. At lower or higher temperatures and a lower relative humidity, the fat-body cannot dissolve and be assimilated and the eggs do not mature. Under favourable conditions, oviposition is more intense if the food of the adults is less concentrated.

Sviridenko (P. A.) & Nosova (M. I.). **Distribution and Migration of Clover Weevils** (pp. 330–333). Of weevils of the genus *Apion* found in clover fields in a district in the Province of Moscow, *A. apricans*, Hbst., and *A. flavipes*, Payk., represented 53·3 and 46·65 per cent., respectively, whereas *A. aestivum*, Germ., which is generally believed to be one of the most important species attacking clover in Russia [*cf.* **26** 307], represented only 0·05 per cent. The numbers of *A. apricans* and *A. flavipes* in clover fields rose suddenly in spring owing to migration of the overwintered weevils from their hibernation quarters, and in mid-summer owing to the emergence of the young adults, and fell sharply at the end of the summer and in autumn owing to the death of the old weevils and the flight of the young ones to hibernation quarters. Most of the weevils were found to overwinter on the surface of the soil near the roots of grasses or under fallen leaves in or near a birch forest ; only a few hibernated in clover fields.

Egorova (A. I.) & Ozol (A. A.). **Development of the Clover Weevil *Apion apricans* Hbst. and its Relation to Time of Harvest** (pp. 333–338).

Field observations in the Province of Moscow showed that maximum oviposition of *Apion apricans*, Hbst., on wild and cultivated clover occurred before the flowering of the plants, the eggs being laid in the forming buds. During the period of flowering, the eggs were deposited in both buds and inflorescences; the females showed no tendency to select the most developed ones for oviposition [**26** 307]. The clover was more severely infested when it was growing sparsely and also when it was on a southern slope. Various observations and experiments showed that the eggs, larvae and pupae have considerable resistance to desiccation, and that larvae that have reached the second instar can complete development by feeding on the stems of clover when transferred from the inflorescences. The evidence indicates that up to 80–87 per cent. of the larvae and pupae present in the heads of clover at the time of mowing survive and produce adult weevils under different conditions of drying. If, however, the clover is mown after oviposition is over but before the new adults emerge, it is possible to concentrate the maximum number of the weevils in places where the hay is stored and destroy them there [*cf.* **26** 308]. Observations after mowing showed that 2·5 per cent. of the weevils remain in the field as larvae and pupae in fallen inflorescences, 10·3 per cent. emerge as adults during the actual drying of the clover, and 87·2 per cent. in different stages are stacked with the hay and continue development in the ricks. Most of the young adults remain near the hay ricks, at least for some days, feeding on clover, or, in its absence, on other plants.

Luk'yanovich (F. K.). **Distribution of the Flax Weevil** *Ceuthorrhynchus sareptanus* **Schultze** [in Siberia] (pp. 344–347). Semenov (A. E.). **The Flax Weevil** *Ceuthorrhynchus sareptanus* **Schultze** (pp. 347–350). Kozhanchikov (I. V.). **Effect of Temperature and Humidity on the Development of** *Plusia gamma* (pp. 350–351). The information contained in these three summaries has already been noticed [**26** 351].

Kozhanchikov (I. V.). **Experiments on the Effect of Humidity on the Development of the Corn Borer** *Pyrausta nubilalis* **Hb.** (pp. 361–363). Further investigations on the development of *Pyrausta nubilalis*, Hb. [*cf.* **25** 140] showed that, under optimum temperature conditions, eggs (laid on glass or cardboard) were able to develop only at a relative humidity of 70–100 per cent.; half of the eggs died at 70 per cent. humidity. At temperatures higher or lower than the optimum, complete mortality occurred at 75 or 80 per cent. humidity. First-instar larvae developed only at 95–100 per cent. humidity, though the range of favourable temperatures extended from 15 to 33°C. [59–91·4°F.]. Experiments with 25 species of plants belonging to 17 different families showed that the first-instar larvae are not highly polyphagous, but there was no mortality among those fed on Urticaceae, *Ulmus glabra* (*montana*), *Poa pratensis*, *Polygonum aviculare*, *Potentilla* sp., and *Artemisia vulgaris*. The pupae were able to develop within a range of humidity extending from 25 to 100 per cent., irrespective of whether they originated from the northern districts, where the larvae feed on hemp, or from the south (North Caucasus) where they feed on maize. The resultant females, however, were not equally fertile, as those from pupae kept at 100 per cent. humidity laid the greatest number of eggs, averaging 200 per female. High fertility (with a maximum of 500 eggs) and normal longevity occurred only at

100 per cent. humidity ; at 80 per cent. the average number of eggs deposited by individuals kept on an unlimited diet of water and sugar dropped to 42, and the period of egg-maturation lasted up to 10 days instead of 3·7. No eggs were laid at 70 per cent. humidity, and few or none were matured at 50 per cent. There was no significant difference in the number of eggs laid by females given water, or 5, 15 or 40 per cent. glucose, but a considerable drop in egg-production occurred in females given no water or food.

Rumyantzev (M. D.). **Duration of external Feeding of Larvae of *Pyrausta nubilalis* Hb. in Relation to the developmental Phase of the Hemp** (pp. 363–365). Observations in the southern part of the Province of Gor'kiĭ in 1932–36 showed that, irrespective of the time of the sowing of the crop, the larvae of *Pyrausta nubilalis*, Hb., were able to penetrate into the stems of male hemp only during and after the period of flowering, and into those of female hemp only when the plants reached the phase of milky and waxy ripeness. If the hemp has not yet passed the flowering stage when the larvae hatch, they feed on the surface of the stems ; they may moult several times before actually making their way into them. The duration of external feeding is entirely dependent on the age of the hemp at the time of hatching and may be as short as a few hours or as long as several days. The factors that hinder the penetration of the larvae into the stems have not been ascertained. It has also been found that if the hemp is thin, the larvae remain for a longer period on the surface, being unable to penetrate inside ; eventually they make their way into the panicles [*cf.* **25** 148], which explains the fact that, in thin-stemmed hemp, it is the panicles that are chiefly infested. The increase in infestation of female hemp after male hemp has been harvested is not the result of the migration of the larvae, but is primarily due to the fact that at this period the stems of the female hemp are in a stage in which the larvae are able to penetrate into them. The longer the period of external feeding of the larvae, the higher is the percentage of mortality among them, owing to exposure to various unfavourable conditions. Many more larvae survive, therefore, on early sown hemp or hemp with thick stems, as they are able to enter the stems sooner. On plants of which the stems had an average height of 15, 30 and 34 ins. and a thickness of 1·3, 3·6 and 4 mm., the percentages of larvae surviving were 0·6, 3·2 and 34·6, respectively.

Laduizhenskaya (L. A.). **Effect of ecological Conditions on the Survival of Eggs and Larvae of *Pyrausta nubilalis* Hb. on Hemp** (pp. 366–368). The presence of weeds in fields of hemp is of great importance for the survival of *Pyrausta nubilalis*, Hb. ; observations showed that when the flowering of hemp was retarded, 68 per cent. of the eggs were laid on weeds, and 67–100 per cent. of the larvae that developed on them survived. In field experiments in White Russia, in which eggs were artificially placed on hemp, no appreciable difference was found in the survival rate of the eggs on the lower, middle or upper parts of the plants. Owing to the low relative humidity (30–40 per cent. in the day time), 25–30 per cent. of the eggs did not hatch, because the fully developed young larvae could not make their way out through the chorion. The drought also made the hemp less suitable for the feeding of the first-instar larvae. In experiments in which larvae were reared on different plants, development was quickest and the rate of survival highest on maize, *Artemisia vulgaris* and hemp,

in that order. Weeding of hemp is an important control measure and should be carried out at the beginning of the flight of the moths, again during the mass flight, 25–30 days later, and a third time before the picking of the male hemp. It is essential to destroy all the weeds removed.

Ponomarev (A. V.). **Effectiveness of the Measures for controlling Pests and Diseases of Hemp on collective Farms in Novgorod-Seversky District, Chernigov Region** (pp. 368–371). Satisfactory results in the control of pests and diseases of hemp in a district in northern Ukraine were obtained by clean cultivation and weeding, supplemented by sowing trap-strips of hemp round all the hemp fields and destroying the flea-beetles [*Psylliodes attenuata*, Koch] that concentrated on them by dusting with sodium fluosilicate, and catching the flea-beetles at regular intervals on the crop with nets. Counts of the flea-beetles in hemp fields before and after the application of this programme showed a sharp reduction in their numbers and a decrease in the injury caused to the crop. Only a few beetles entered hibernation.

Shchegolev (V. N.). **Effectiveness as a Control Measure of special Sowings of Hemp to attract the Hemp Flea** (*Psylliodes attenuata* **Koch**) (pp. 371–374). Owing to the practice in northern Ukraine of sowing hemp as late as the first half of June, the overwintered adults of *Psylliodes attenuata*, Koch, which are polyphagous, disperse over a wide area in spring and feed chiefly on nettle, sprouting self-sown hemp and hops. Since it is impossible to control them under such conditions, trap-strips of hemp were sown on 28th April round the fields on one farm in which this crop was to be sown later. The total length of the strips was about 3 miles. Counts of the flea-beetles on them and on nettles, made at regular intervals in May and the first half of June, showed that large numbers of the beetles congregated on the strips, to which they gradually migrated from the nettles. In strips dusted with a mixture of sodium fluosilicate and talc (1 : 1) at the rate of about 15 lb. per acre, the number of flea-beetles was reduced by 42·2 per cent. in 4 days. Sweeping with a net caught 52·5 per cent. of the beetles. As a result of these measures, the injury caused to hemp and the number of flea-beetles entering hibernation sharply decreased, and the yield of seeds and fibre was much higher than on farms where no trap-strips were sown.

Tyumeneva (V. A.). **Leaf Rollers in the Orchards of Slavyansky District** (pp. 379–382). Fruit trees in Slavyansk, a district in the western part of North Caucasus, were attacked by 25 species of Tortricids in 1936. Of these 9, all of which were scarce and occurred on apple, have not yet been identified ; a list is given of the others with notes on their abundance. The most important were *Tortrix* (*Cacoecia*) *reticulana*, Hb., which had three generations in the year, *T.* (*Pandemis*) *heparana*, Schiff., *Eucosma* (*Tmetocera*) *ocellana*, Schiff., and *Ancylis selenana*, Gn., which had two, and *T. diversana*, Hb., *T.* (*Cacoecia*) *lecheana*, L., and *Argyroploce variegana*, Hb., which had one. Most of the Tortricids occurred in equal numbers on apples and pears in spring at the time of flowering and bursting of the buds, whereas the second and third generations developed chiefly on apple. Stone-fruit trees were not attacked. The species with one annual generation were injurious only till the beginning of June. Most of the damage to the fruits was caused from mid-July to mid-August by the second and

third generations of *T. reticulana* and the second generations of *T. heparana* and *E. ocellana*. Besides causing the apples to drop, the larvae make wide shallow wounds on them, as a result of which they become infested with rot. Damage to the fruits was considerably reduced by spraying with barium fluosilicate or applying dusts of barium fluosilicate or calcium arsenate (both used alone or impregnated with spindle oil) or a mixture of barium fluosilicate and magnesium arsenate. Spraying with Paris green gave unsatisfactory results.

Lesnikovskiĭ (A. Ya.). **Testing the Toxicity of Silicate Fluoride Barium under Orchard Conditions** (pp. 382–383). A programme of two dusts and two sprays of barium fluosilicate was tested against fruit weevils [*Rhynchites* spp.] on apple trees in the district of Slavyansk. The first dust was applied when the buds were separating and the second immediately after petal fall; the two sprays (at a concentration of 1 per cent.) followed on dates that are not stated. The treatments caused no scorching and gave a reduction of 50 per cent. in damage to the fruits by the weevils.

Shumakov (E. M.). **Distribution of the Codling Moth and Methods of Control** (pp. 384–386). From investigations in apple orchards in North Caucasus, the author confirms the findings of others that the percentage of fruits infested by the codling moth [*Cydia pomonella*, L.] is lower and the absolute number higher when there are larger numbers of fruits on the trees [**20** 147; **26** 357]. He gives a formula for estimating the probable percentage infestation by second-generation larvae of trees bearing different numbers of fruits. Of the total infestation, 75 per cent. was found to be due to the second generation. The even distribution of infestation in an orchard is prevented by various factors, such as the occurrence of different varieties of apples necessary for correct pollination, the difference in the fruit-bearing capacity of the individual trees, and the presence of foci of infestation where the harvested fruit is stored. This renders unreliable the practice of estimating the effectiveness of control measures by comparing the percentage infestation of fruits from treated and untreated plots; it would be better to base the estimate on pairs of selected strictly comparable trees.

Zotzenko (L. N.). **Outline of Plans for controlling the Codling Moth** (pp. 387–389). The codling moth [*Cydia pomonella*, L.] has two overlapping generations a year in the Slavyansk district. In 1936, the larvae of the first generation were active in June and those of the second from 24th July. Infestation by the first generation was very slight, but the second infested 40–46 per cent. of the apples and 70–80 per cent. of those that dropped in August. Experiments were carried out with sprays of Paris green containing 46·16 per cent. As_2O_3 and used at a concentration of 0·1 per cent. The first spray against the first generation was applied on 20th May, when 85–90 per cent. of the petals had fallen, and the first spray against the second generation on 18th July, when adults had emerged from 25 per cent. of the cocoons in trap bands. When three sprays at intervals of only 3 days were applied against each generation, the damage by the first generation was reduced (in comparison with controls) by 81·1 per cent. for one variety of apples and 71·4 per cent. for another, the corresponding figures for the second generation being 55·7 and 50·8 per cent. When the intervals between the applications were increased to 10 days, the

reductions were 53·7 and 60 per cent. for the first generation and 61·3 and 51·3 per cent. for the second. With 10-day intervals, poor results were obtained by omitting the second-generation sprays or applying them after only one spray against the first.

Ruisakov (S. V.). **Losses from Apple Pests in Slavyansky District** (pp. 390–392). The author estimates from investigations that insect pests and diseases reduce the potential yield of apples in the Slavyansk district by 43–79 per cent., even when allowance is made for natural shedding of fruitlets. Fallen fruits constitute the bulk of the loss, and the codling moth [*Cydia pomonella*, L.] is responsible for 33–50 per cent. of them.

Nevskiĭ (V. P.), Uspenskaya (N. V.) & Shaposhnikova (E.). **Elaboration of a Control Program for the Codling Moth,** *Cydia pomonella* **L.** (pp. 393–399). In experiments against *Cydia pomonella*, L., on apple in north-eastern Uzbekistan, different insecticides prepared in the Russian Union were compared with lead arsenate and Urania green. The lead arsenate contained 20·5–29·7 per cent. As_2O_5 and was used at the rate of 3 lb. to 100 gals. water, and the Urania green contained 50·7 per cent. As_2O_3 and was used at the rate of $1\frac{1}{2}$ lb. with 3 lb. lime to 100 gals. Three sprays were applied against the first generation, two against the second, and one or two against the third. The intervals between sprays against a given generation were 10 days. The results were estimated by the percentage of infested fruits, the numbers of larvae in trap bands, and the mortality of newly hatched larvae placed on apples taken from the treated trees at periods varying from 4 hours to 30 days after the application of the spray. The most effective of the Russian insecticides was Soviet green, which is a preparation of the type of Paris green containing 42·2 per cent. As_2O_3 and was used with lime at the same concentration as the Urania green. It killed 69·7 per cent. of the newly hatched larvae as compared with 72·5 per cent. killed by Urania green, and 80 per cent. by lead arsenate, and the relative effectiveness of these three sprays in the orchard was in the same order. The other preparations were much less effective or were too injurious to the trees for practical use, except that sprays of calcium arsenate against the first generation followed by Soviet green against the second gave promising results. Nicotine sulphate and anabasine sulphate were ineffective when used alone, even if they were prepared as " fixed compounds " adsorbed on sulphur, but they increased the effectiveness of arsenical sprays to which they were added.

The authors estimate from various observations that about 80 per cent. of the hibernating larvae are killed by the removal of the loose bark from the trees, and about 3 per cent. die from unfavourable climatic conditions. In summer, the mortality of the eggs, larvae and pupae reached 99·92 per cent., which included 35·4 per cent. of the larvae destroyed by sprays and trap bands. The reproductive potential of the moth is so high, however, that the population will not be reduced unless the rate of mortality of the immature stages is over 99·98 per cent.

Berezina (S.). **Effect of Bands treated with Beta-naphthol on new and old Bark of Apple Trees** (pp. 399–400). In experiments in Central Asia, impregnated bands were applied to apple trees with young or old bark on 10th June and were left in place for 130 days. The bands

were impregnated with beta-naphthol and brake oil, which were used either alone or together, or in combination with ozocerite. Examination of samples of the bark from the part of the stem covered with the band and from the adjoining area showed that beta-naphthol combined with oil scorches the bark, makes it very dark and causes swelling ; a layer of periderm is formed, which breaks off a part of the phloem and produces a crust of varying thickness, irrespective of the dosage or of the material used for the band. When oil or beta-naphthol was used alone, the crust was not formed in the first case, and only sometimes in the second. In general, beta-naphthol acts when it is in direct contact with the bark, its vapours being less injurious. In experiments in which beta-naphthol mixed with oil was applied to fresh wounds on twigs, there was severe scorching and half of the twigs dried up, whereas with beta-naphthol or oil alone, or oil mixed with ozocerite, the scorching was slight, a callosity formed and 90 per cent. of the twigs continued to develop normally. In the presence of natural cracks, beta-naphthol may penetrate deeper radially and injure the phloem and cambium. The application of a layer of clay did not prevent beta-naphthol from penetrating into the bark, and increased the permeation of the trunk with oil. The addition of ozocerite to the mixture of beta-naphthol and oil reduced this permeation, but did not safeguard the bark from scorching. It is concluded that bands impregnated with beta-naphthol should not be used on trees with young bark.

Ignat'eva (Yu. V.). **The possible Substitution of natural Resins for imported Resins in the Preparation of Caterpillar Glue** (pp. 402–404). Experiments have shown that colophony can be made suitable for use in the preparation of banding adhesives by treating it with chlorine. The resulting changes in the chemical constants of the colophony are shown in a table. An adhesive containing 38·5 per cent. treated colophony, 57·5 per cent. castor oil, 3 per cent. beeswax and 1 per cent. water has been prepared and tests with it are being made. A study of the physico-chemical constants of resin extracted from certain plants occurring in the Russian Union showed that the resin obtained from *Scorzonera latifolia* may be of value in the manufacture of adhesives.

Polzik (P. N.). **Synthetic Resins and Wax in the Development of Formulae for Caterpillar Glue** (pp. 404–406). In the course of investigations on the manufacture of banding adhesives from synthetic resins combined with beeswax, a very effective adhesive has been obtained, the formula for which is given, containing a resin prepared in a Leningrad chemical combine, dissolved in castor oil. Laboratory tests and preliminary field experiments demonstrated its high value. Its properties, such as resistance to cold, rain and heat, adhesiveness and durability, are given in a table in which they are compared with those of American and German brands of tanglefoot.

Popova (A. I.). **Measures for the Protection of Fruit Trees from the San José Scale in the Krasnodarsky Region** (pp. 406–410). The effectiveness of the spray programme officially recommended against the San José scale [*Aspidiotus perniciosus*, Comst.] in the Krasnodar region was tested on young apple trees on the Black Sea Coast. A 4 per cent. emulsion of petroleum oil applied before the swelling of the buds, when the first-instar larvae were moulting and were thus in a critical stage, gave very good results, mortality being 100 per cent.

where spraying was thorough and the Coccids were not sheltered by loose bark. On the other hand, a 1 per cent. emulsion applied just before flowering and immediately after petal fall was competely ineffective; the female Coccids were young adults, which represent the most resistant stage. Unsatisfactory results were also given by 1 per cent. emulsions of alkalised spindle oil distillate, prepared with iron or copper sulphate and applied in late spring and summer against the young of the first and second generations, as the females were not affected and continued to produce new offspring.

Nekrasova (Z. N.). **Field Tests of Hydrogen Sulfide as a Control of the San José Scale** (pp. 410–413). In fumigation experiments in North Caucasus, 100 per cent. mortality of the San José scale [*Aspidiotus perniciosus*, Comst.] on grafting slips of apple, pear, plum and sloe was obtained in the second half of April by using hydrogen sulphide, at dosages of 1 oz. to 10 cu. ft. space at 17°C. [62·6°F.] for 60 minutes, or 2 and 3¼ oz. at 16 and 14°C. [60·8 and 57·2°F.], respectively, for 30 minutes. It was immaterial whether the fumigation chamber was completely or only partly filled with the slips. In one series of tests on 13th August, all the scales were killed with dosages of 1, 1½ or 2 oz. to 10 cu. ft. at 25 or 26°C. [77 or 78·8°F.] and an exposure of 30 minutes, but, in another series with the dosage of 1 oz. to 10 cu. ft. at 25°C., exposures for 30 and 60 minutes both gave only 99·8 per cent. mortality. The slips were not affected by the treatment. Fumigation in the autumn of 3-year-old apples, pears, plums and apricots with dosages of 2 or 3 oz. to 10 cu. ft. at 12°C. [53·6°F.] and an exposure of 30 minutes killed all the scales and did not injure the trees. A dosage of 1 oz. gave 99 per cent. mortality.

Kraĭter (A. D.). **Tests of new Emulsions for Summer Sprays in the Control of San José Scale (*Aspidiotus perniciosus* Comst.) on Apple Trees** (pp. 413–417). A worker in northern Caucasus had claimed that good control of *Aspidiotus perniciosus*, Comst., is obtained with a 2 per cent. concentration of an emulsion of a Russian machine oil distillate of great viscosity and comparatively high polarity, and that the leaves are very little injured. The author therefore carried out experiments in the district of Slavyansk at the beginning of July with 1 and 2 per cent. concentrations of this emulsion against the first- and second-instar larvae and adult females of the scale on apples of different varieties. The results were very unsatisfactory, as the mortality of the females was much too low to be of any practical value, and most of the varieties of apples were badly scorched.

Karumidze (S.). **Resumé of Tests with different Concentrations of Oil Emulsions against Scales on Apple and *Citrus* Trees** (p. 418). In field experiments carried out in the summer of 1936 in western Georgia against *Aonidiella aurantii*, Mask., on *Citrus*, two mineral oil emulsions of Russian manufacture failed to give effective control and were very injurious to the leaves of the trees. Spraying apples in eastern Georgia with a 2 per cent. concentration of the emulsion discussed in the preceding abstract is stated to have given a satisfactory rate of mortality of third-instar larvae of *Lepidosaphes ulmi*, L., and still better results against *Aspidiotus perniciosus*, Comst. At this concentration the leaves were not scorched, but in the second half of the summer the fruits were injured. The eggs of *L. ulmi* were not affected by a 5 per cent. concentration.

Timokhina (N. I.). **Mineral Oil Emulsions emulsified with amorphous Arsenates and Arsenites** (pp. 419–421). The author outlines a method of obtaining amorphous precipitates of arsenates or arsenites and using them as emulsifiers for oils. It was thought that if an emulsion prepared in this way was used in sprays against the codling moth [*Cydia pomonella*, L.], the particles of oil and arsenate would both adhere well to the leaves and fruits of apple. Such an emulsion, prepared with brake oil and calcium arsenate was, however, one of the sprays found too injurious for use in recent experiments [**26** 479] ; it caused severe scorching of both foliage and fruit.

Ivanova (N. A.). **The Specificity of Mineral Oils for destroying Eggs of the Apple Sucker** *Psylla mali* **Först.** (pp. 421–423). During investigations in the province of Voronezh on the effect of oil emulsions on eggs of *Psylla mali*, Schm. [**26** 353], it was found that, unlike petroleum oils, which do not stop the development of the embryos but prevent the hatching or survival of the young nymphs, coal-tar oils are true ovicides, causing the eggs to dry up. Even at 2 per cent. concentrations, an anthracene oil or a heavy fraction of tar oil killed 98 and 99 per cent. of the eggs, respectively, as well as the few larvae that hatched. The flower and leaf rosettes of apple trees sprayed with emulsions containing these oils were entirely free from nymphs. The addition of the tar oil to a petroleum-oil emulsion considerably increased its truly ovicidal effectiveness.

Éidel'man (Z. M.) & Novikova (N. G.). **The Nature of Injuries to Apple Trees caused by Oils** (pp. 423–426). With the view to determining characters that would differentiate the injuries caused to fruit trees by frost from those caused by the incorrect application of mineral oils, apple seedlings were subjected to frost in a refrigerator or were smeared with non-emulsified machine or solar oil. It was found that the oil penetrates into the wood through the leaf buds on the bark and not through the cork tissues. Penetration is greatly retarded and reduced if the oil is viscous. The typical injury caused by oils is chiefly localised in the bark and bast, and oils are not responsible for injuries in which the dying of the tissues spreads outwards from the heartwood or the cambium layer. The dying of the buds is the first indication of injury by oils, as those of low viscosity penetrate into the tissues and those of high viscosity disorganise and reduce the gaseous interchange in the process of respiration. The buds should therefore be first considered when investigating injury by oil. In seedlings subjected to frost, the typical character of the injury is its irregular distribution. The frost also causes microscopic splits in the tissues of the xylem. Parts of the tissues of the xylem are destroyed, the phloem, cambium layer and heartwood parenchyma are injured, and all the tissues in general turn brown.

Observations on the movement of oil in the treated seedlings showed that the amount present in the branches and trunk gradually decreases, as, probably with the beginning of the movement of the sap, the particles are gradually driven towards the roots, from which also they eventually disappear. This shows that oil is not accumulated in the tissues of plants that are sprayed year after year.

Pushin (F. E.). **Tests of large dusting Apparatus under Orchard Conditions** (pp. 427–429). Tests showed that dusting apparatus drawn by a tractor is of value in old apple orchards, whereas horse-drawn apparatus is of use in both old and young plantations. The

dust applied was barium fluosilicate, and the best results were obtained with a swinging nozzle, especially when the dust was slightly moistened with water (at the rate of about a pint for 8 trees), which made it adhere better to the leaves.

Pushin (F. E.). **Tests of Devices for increasing the Effectiveness of large Orchard Sprayers** (pp. 429–434). A description is given of equipment attached to a tractor sprayer that enables it to spray pairs of trees from both sides at the same time. It is designed for trees 13–16 ft. high, with crowns 13–16 ft. wide planted 36 ft. apart. A horizontal rod fixed above the tractor is long enough to pass over the two trees, and the spray is applied from four pipes that hang from it, one on each side of each tree. Further nozzles along the rod spray the tree from above. The results obtained with this equipment were superior to those given by an ordinary spray lance, as the distribution of the liquid on the trees was more even and more spray adhered to the leaves even when the amount applied per tree was less. It also sprayed twice as many trees in a unit of time.

Pushin (F. E.). **A new Machine Universal Sprayer-Duster** (pp. 434–439). Certain alterations in an apparatus constructed in the Russian Union for applying pure oils as atomised sprays against the San José scale [*Aspidiotus perniciosus*, Comst.] have made it possible to use it for applying other orchard sprays, both at normal and unusually high concentrations, and for applying dry dusts or dusts slightly moistened with water.

de Macedo (W.). **Plant Inspection with special Reference to Dock Routine.**—*Proc. ent. Soc. B.C.* no. 34 pp. 3–7, 5 refs. Victoria, B.C., February 1938.

A brief account is given of the procedure of inspection of plants and plant products at the port of Vancouver, together with lists of some pests intercepted in passengers' luggage and in freight. Unusual interceptions made during a survey of various types of containers and packing materials during 1935 and 1936 included *Scolytus intricatus*, Ratz., and *Hylesinus* (*Leperisinus*) *fraxini*, Panz., in willow, ash and birch crates from England [*cf. R.A.E.*, A **25** 370].

Andison (H.). **The Long Winged Thrips** (*Scirtothrips longipennis* **Bagn.) and its Control in Greenhouses.**—*Proc. ent. Soc. B.C.* no. 34 pp. 12–17, 2 figs., 7 refs. Victoria, B.C., February 1938.

Scirtothrips longipennis, Bagn., the adult of which is described, has caused injury of recent years to several species of flowering plants in greenhouses on Vancouver Island. The damage is particularly severe on begonia and cyclamen ; the adults and larvae feed on the leaves, stems and flowers, the punctures on the leaves resulting, after 9–16 days, in rusty-brown corky serpentine lines. Injury to the flowers is rare on begonia, but serious on cyclamen ; in some cases, feeding beneath the bud scales of the bloom prevents it from opening fully. The plants become stunted after prolonged attack. The thrips breeds rapidly in warm greenhouses and is particularly active on bright days at temperatures above 75°F.

In experiments on control, which were carried out on begonias, as they are particularly susceptible to injury by insecticides, dusts

containing nicotine or naphthalene did not penetrate well enough to kill thrips sheltered in the curled and distorted leaves. Sprays containing Volck oil, or Paris green and lime scorched the leaves, as did molasses used with nicotine sulphate, but good results were obtained with sprays of derris and soap or nicotine sulphate and coal oil [kerosene] emulsion. The latter was selected for further work, as it is also effective against mealybugs. It was used by growers on an extensive scale and kept begonias free from damage by the thrips when applied at intervals of 10 days. In the original formula, the oil was emulsified with fish-oil soap, but this causes the plants to have an unpleasant odour. In the formula ultimately adopted, a stable stock emulsion is prepared with 10 fl. oz. oil, 5 fl. oz. water and 1 oz. linseed-oil soap, and this is diluted at the rate of 3 oz. per gal. for spraying. The nicotine sulphate is added at the rate of 1–2 fl. oz. to 8 gals. spray.

HERIOT (A. D.). **Biological and Morphological Differences between *Eriosoma crataegi* (Oestlund) and *Eriosoma lanigera* (Haus.).**— *Proc. ent. Soc. B.C.* no. 34 pp. 22–32, 2 figs., 14 refs. Victoria, B.C., February 1938.

It is generally considered that the woolly apple aphis, *Eriosoma lanigerum*, Hsm., migrates in autumn to American elm (*Ulmus americana*) in eastern North America [*cf. R.A.E.*, A **6** 312; **24** 10], though in the rest of the world it passes the whole of its development cycle on apple [**14** 221]. In 1887, a woolly aphis taken on *Crataegus* in Minnesota was described as *E. crataegi* by Oestlund, though individuals taken 10 years previously on *Crataegus* in Ontario had been noted under the name *E. lanigerum*. The woolly aphis appears to have been widespread and common in North America on *Crataegus* long before apple was seriously infested [**3** 421]. In Maine, in 1912, the Aphid responsible for the rosette leaf curl of *Ulmus americana* was found to migrate to both mountain ash [*Sorbus* sp.] and *Crataegus* [**1** 24], and the spring migrant readily accepted apple. It was later proved to differ morphologically from *E. americanum*, Riley, which was found to have a life-cycle on *U. americana* and *Amelanchier* [**4** 132]; *E. rileyi*, Thomas, remains on elm throughout the summer. As *E. lanigerum* and the species causing rosette of elm had apple as a common food-plant, and they could not be separated by the antennae, the basis on which most species of *Eriosoma* are distinguished, they were regarded as the same species, though the conclusion was not universally accepted [**20** 442].

Recent observations on a woolly aphis that has appeared on *Crataegus* in the interior of British Columbia indicate that it is distinct taxonomically and biologically from *E. lanigerum*. The latter had been common in the irrigated orchards of the dry belt of British Columbia for more than 20 years, and an extensive study of it [**18** 342] was made following a rapid increase in 1926–27. *Crataegus* is abundant in most parts of the interior of British Columbia, but the native species are distinct from those in the east. English and American elms are numerous in some localities, while one or both are absent in others. The presence, or species, or proximity of elm does not appear to influence the extent or degree of infestation of apple by *E. lanigerum*. During 1928–36, no rosettes were found on elm, and native *crataegus* and mountain ash were free from woolly aphis. In Vernon, alate

sexuparae appear in the autumn as they do in Europe, and some of the hibernating forms developed into sexuparae in May 1932 and produced abnormal sexuales. Two viviparous alates and one pupal form were found in different years during summer, but in autumn, every effort to procure the sexes and egg by caging sexuparae on elm failed. There was a marked decline in infestation of apple after 1933. In July 1935, two small infestations by a woolly aphis, about a quarter of a mile apart, were discovered on *Crataegus* ; one of them was in a yard containing several young apple trees (which, some years before, had been susceptible to attack by *E. lanigerum*) and bounded on the east side by a hedge of *Crataegus* with an apple tree to the south and an American elm to the north. Thousands of alatae of *E. lanigerum* had been caged on this elm, but no rosette had been produced. *E. lanigerum* was not present on apple in the locality when the woolly aphis was found on *Crataegus*. In August, sexuparae from *Crataegus* were caged on the elm. In the following spring, several rosettes appeared on this elm and on others in the neighbourhood. During 1936 and 1937, the Aphid followed the development recorded in the east and agreed with the characters described and depicted for the rosette aphis during its sojourn on elm. There were hundreds of rosettes on American elm in the spring of 1937. Infestation also spread rapidly on *Crataegus*, but apples remained entirely free from attack. In cage tests, the Aphid showed no inclination to go to apple. In one cage test, a number of pupal forms prematurely left the drying leaves of the rosette and were found with their stylets inserted in the stem of *Crataegus* among the progeny of the migrants. As the migration from *Crataegus* to elm was complete, apple trees infested by elm migrants and by *E. lanigerum* together would show the partial migration to elm recorded in the east [**5** 477]. Dissections have shown that the alatae that migrate to elm from *Crataegus* contain a larger number of sexual forms than those that stay on apple, and there are more than twice as many males as females in the offspring of the virile elm sexuparae, whereas in the impotent sexuparae on apple the opposite is the case. The males of the woolly aphis of elm and *Crataegus* and the females of the apple aphis are deposited first.

The author discusses in some detail various morphological characters that serve to distinguish *E. crataegi* and *E. lanigerum* and concludes that they are specifically distinct. It appears that the species studied on apple in Vernon since 1928 is *E. lanigerum* and that the recently introduced woolly aphis on *Crataegus*, which passes the winter on elm, is *E. crataegi*.

VENABLES (E. P.). **Further Notes on the Woolly Aphis Parasite *Aphelinus mali* Hald.**—*Proc. ent. Soc. B.C.* no. 34 pp. 33–35. Victoria, B.C., February 1937.

Aphelinus mali, Hald., introduced into the Okanagan Valley for the control of *Eriosoma lanigerum*, Hsm., on apple in 1929 [*R.A.E.*, A **20** 66], was reared in large numbers in the next four years on caged apple trees and was successfully spread to nearly every part of the Valley, being recovered long distances from the points of release. It was found to have crossed Okanagan Lake, a distance of two miles. There have been no outbreaks of *E. lanigerum* since the introduction of the parasite, but, as they are known to be of periodic occurrence, this cannot be definitely attributed to it. Reinfestation occurred each

year in all cages, as the parasite never destroyed all the Aphids. The abundance of the two insects appeared to be affected by similar conditions. Experiments showed that an Aphid parasitised in the second instar dies 9–13 days later and does not reproduce. In early summer, when the Aphids settled in axils of the leaves above the new buds, of which 75 per cent. may harbour 1–3 individuals or more, 60 per cent. were sometimes destroyed by *A. mali* and later infestation checked.

RICHMOND (H. A.). **Some Notes on the Periodicities of certain Insects in Relation to the Sun Spot Cycle.**—*Proc. ent. Soc. B.C.* no. 34 pp. 49–53, 1 graph, 8 refs. Victoria, B.C., February 1938.

The nature of sun-spots and their effect upon weather are briefly discussed. A chart of sun-spots between 1860 and 1934 on which periodical outbreaks of various insects are marked shows that maximum outbreaks of grasshoppers in the neighbourhood of Nicola, British Columbia, coincided with the sun-spot minimum, whereas in the neighbourhood of Chilcotin they occurred between the sun-spot maximum and minimum, except that there was no outbreak between 1913 and 1917 and the 1934 outbreak coincided with the sun-spot minimum. The latter exception may be due to the influence of overgrazing. The difference between the relations of the two series of outbreaks to the sun-spot cycle may be explainable by the different effect of modifications of the weather under dissimilar climatic conditions [*cf. R.A.E.*, A **21** 50]. The outbreaks of locusts [*Schistocerca gregaria*, Forsk.] in Palestine [**17** 652] are shown to occur in general a few years after the sun-spot minimum, except that of 1928, which coincided with the maximum. Of the last three peaks of bark-beetle outbreaks in British Columbia, the first two occurred at the sun-spot minimum and the third about a year before it. The periodical outbreaks of *Ellopia somniaria*, Hulst., show no apparent relation to the sun-spot cycle.

BEALL (G.). **Analysis of Fluctuations in the Activity of Insects. A Study on the European Corn Borer, *Pyrausta nubilalis* Hubn.**—*Canad. J. Res.* (D) **16** no. 3 pp. 39–71, 4 diagr., 15 refs. Ottawa, March 1938.

The following is the author's abstract of this detailed analysis of the relations between physical conditions and the numbers of adults of *Pyrausta nubilalis*, Hb., observed nightly in one or more plots of maize at Chatham (Ontario) during the summers of 1927–33 : The numbers of moths in flight, from night to night, over areas on which observations were made concurrently, show high correlations, although catch on non-contiguous areas differed more than would have been expected by chance. Polynomials of the fourth degree were found the most satisfactory relations to fit in determining seasonal trend of flight for each year.

The relations between numbers of moths in flight and physical conditions in the evening were investigated by the variate-difference procedure, using first differences. The numbers of moths and evening temperature showed a consistent moderate positive correlation. The numbers of moths and daily maximum temperature were positively correlated, but the partial correlation, holding evening temperature

constant, showed no relationship. The numbers of moths and evening humidity were not correlated either simply, or as a partial correlation holding evening temperature constant. The numbers of moths and evening wind velocity, both simply and as a partial correlation holding evening temperature constant, showed a consistent moderate negative correlation.

For the relation between temperature and activity, two successive approximations to a polynomial of the third degree were fitted jointly to all years. For temperatures below 60°F. there was no appreciable activity on the part of the moths. Activity increased with rise in temperature, although less rapidly as temperature became high. In general, activity at a given temperature was greater as the temperature of the preceding day was low.

Balch (R. E.). **The Spruce Sawfly Outbreak in 1937.**—*Pulp Pap. Mag. Canada* March 1938 repr. 4 pp., 1 map, 7 refs. Montreal, 1938.

The history of the occurrence of *Diprion polytomum*, Htg., on spruce in North America is briefly reviewed from previous reports [*R.A.E.*, A **25** 511, etc.] and reference is made to the cytogenetic investigations of S. G. Smith [**26** 215], which confirm the correctness of its identification and the view that it was introduced from Europe. Its known distribution in America in 1937 is shown on a map and covers 25,000 sq. miles in the United States and 115,000 in Canada. As regards changes in Canada, the infestation appears to have spread slightly in Quebec, but not to the west in Ontario, and to be thinly distributed throughout the mainland of Nova Scotia, while it has been found for the first time on Prince Edward Island. In New York State, the sawfly was present throughout most of the eastern part and extended to about longitude 78°W. Areas of heavy infestation increased in the Gaspé and New Brunswick, and occurred for the first time in the United States, in southern Vermont and New Hampshire and particularly on the Allagash river in northern Maine.

Heavy infestation may occur in practically all types of spruce, pure or mixed, of all ages, but the sawfly prefers white spruce [*Picea glauca*] and, especially on red or black spruce [*P. rubra* or *P. mariana*], foliage not produced on the shoots of the current year. Forced feeding on new foliage was found to cause high larval mortality and a reduction in the size and reproductive rate of survivors, but second-generation larvae thrived on the new foliage of white spruce. Complete defoliation killed all spruce trees, and over 25 per cent. loss of the old needles caused a noticeable reduction in the width of the annual ring of the following year. The killing of a stand is likely to be gradual. Over most of the Gaspé, the only area where important mortality occurred, the volume percentages of mortality of white and black spruce were 64·7, of which not more than 5 per cent. occurred in 1937, and 27·6.

All checks to population increase studied proved to be temporary and the rate will vary according to the year and place ; even red and black spruce will probably suffer serious mortality. Recovery studies in 1937, however, gave increasing proof that the two introduced European parasites, *Exenterus adspersus*, Htg., and *Microplectron fuscipenne*, Zett., have good powers of reproduction and spread under present conditions.

Fiftieth Annual Report (Pennsylvania Agric. Exp. Sta.) for the Year ended June 30th, 1937.—*Bull. Pa agric. Exp. Sta.* no. 352, 69 pp., 8 figs. State College, Pa, October 1937. [Recd. May 1938.]

H. N. Worthley, J. E. Nicholas and D. E. H. Frear report (pp. 53–54) that 5 cover sprays of lead arsenate with fish oil and 3 followed by 2 of tank-mixed nicotine gave the best control of the codling moth [*Cydia pomonella*, L.] on apple in Pennsylvania, but left excessive residues. No satisfactory schedule that did not make washing necessary was found. Molasses and water bait in a 12-in. pan beneath a 75–watt bulb trapped more moths of both sexes than an electrocuting light-trap [*cf. R.A.E.*, A **25** 686].

C. A. Thomas reports (p. 54) that the greenhouse symphylid [*Scutigerella immaculata*, Newp.] injured the roots and shoots of tomato, lettuce and various flowering plants in greenhouses. Steam sterilisation and hot water treatments were partly effective, but better results were obtained by fumigating between crops with carbon bisulphide placed in holes 6–8 ins. deep and 1 ft. apart, at the rate of 1 oz. per hole, the holes then being sealed and the surface of the bed wetted. The soil temperature should be at least 60°F., and a week should elapse before the next crop is planted.

Webster (R. L.) and others. **Division of Entomology.**—*Bull. Wash. St. agric. Exp. Sta.* no. 354 (Rep. 1936–37) pp. 33–36. Pullman, Wash., December 1937. [Recd. May 1938.]

Investigations in Washington have shown that the less refined oils, with a sulphonation test of 75–80 and a viscosity of 50–60 seconds Saybolt, are suitable for use in the new inverted lead arsenate spray mixtures [*cf. R.A.E.*, A **25** 418, 652; **26** 174] in which the oil content is reduced to 0·5 per cent. A mineral oil for use with arsenicals on apple should be able to retain its oily character for a long time, as this probably involves low volatility and slow penetration into the leaf. Of insecticides that are not poisonous to man, cryolite was the most effective against the codling moth [*Cydia pomonella*, L.]. It did not injure the foliage or fruit of apple and was more effective later in the season; when it was applied twice with oil in July or August, residue removal was not difficult. The principle of the inverted spray mixture has been applied to cryolite [**26** 174].

Of mites attacking fruit trees in the irrigated areas of eastern Washington, the European red mite [*Paratetranychus pilosus*, C. & F.] and the brown mite [*Bryobia praetiosa*, Koch] are best controlled by dormant oil sprays, and the rust mite [*Phyllocoptes schlechtendali*, Nal.] and the Pacific mite [*Tetranychus pacificus*, McG.] by various forms of sulphur, of which lime-sulphur and colloidal or wettable sulphurs have been most widely used. Recent investigations have shown that it is desirable to precipitate lime-sulphur for summer use. This is done by adding sufficient zinc sulphate to precipitate the sulphur from the diluted lime-sulphur solution. The resulting spray mixture consists of a colloidal or almost colloidal suspension of zinc sulphide and, probably, free sulphur, and a spreading agent, such as ammonium caseinate, should be used with it. Two applications of such a spray mixture, containing one quart liquid lime-sulphur per 100 gals. water, were reasonably satisfactory.

Investigations in western Washington on the carrot rust fly [*Psila rosae*, F.] showed that emergence occurred during several weeks from about 1st May. Carrots planted before the end of May were likely to be infested by the first generation, but could be protected by scattering crude naphthalene on the soil at the rate of 250 lb. per acre 2 or 3 times at weekly intervals, especially if the carrots were harvested by 1st September.

Though the pea aphis [*Macrosiphum onobrychis*, Boy.] undoubtedly migrates from lucerne to peas, fields of peas close to moderately infested lucerne in eastern Washington were not more severely attacked than those at a distance in 1937. At the higher elevations, where most of the peas are grown and lucerne has been planted to check erosion, the lucerne dried up after the pea harvest, so that the Aphids could not survive on it. It was expected that most of them would overwinter on lucerne grown for hay at some distance from pea fields. The heavy spring rain followed by drought materially reduced the pea crop, and possibly checked the Aphid.

Late sweet maize was heavily infested by *Heliothis armigera*, Hb. (*obsoleta*, F.), and dusting with synthetic cryolite and diatomaceous earth gave only 60 per cent. control. Infestation of carnations by the onion thrips [*Thrips tabaci*, Lind.] was not checked to any extent by a spray of Paris green and brown sugar, which sometimes intensified the injury by causing scorching in the feeding punctures. Some varieties of carnations are more susceptible to the thrips than others.

Hamilton (D. W.) & Pearce (G. W.). **The Spray Residue Situation on Cherries in the Hudson River Valley.**—*Proc. N. Y. St. hort. Soc.* **83** pp. 177–186. Rochester, N.Y., 1938.

Preliminary experiments were carried out in New York in 1937 on the relation between programmes for spraying with arsenicals and the residue on cherries at harvest time. Two non-arsenical spray mixtures were also tested. All the plots received an application at shuck (sepal) fall for the control of the plum curculio [*Conotrachelus nenuphar*, Hbst.], and one or two applications against *Rhagoletis cingulata*, Lw., and *R. fausta*, O. S., the first on 4th or 5th June and the second on 17th June. Powdered skim milk (½ lb. per 100 U.S. gals. spray) and hydrated lime (1 lb. per lb. arsenical) were added to all the arsenical sprays, liquid lime-sulphur (2 gals. per 100 gals. spray) to the shuck-fall application, and flotation sulphur paste (6 lbs. per 100 U.S. gals.) to the other two. Where the shuck-fall spray only was applied, the residue was usually below tolerance at harvest, even where 5 lb. lead or calcium arsenate per 100 U.S. gals. had been used. Where 2½ lb. lead, calcium or zinc arsenate was used in the shuck-fall application, the use of additional arsenical in either of the later sprays, caused excessive residue to be present in all but a few cases. When only 1 lb. arsenical is used in the shuck-fall spray, 1 lb. can sometimes be used in the next spray without raising the residue above tolerance. Arsenical injury to foliage or stem was noticed on some varieties.

Sprays of cubé root (5·3 per cent. rotenone), flotation-sulphur paste and soybean flour (2½, 6 and ½ lb. per 100 U.S. gals. spray) applied on 5th, 15th and 24th June, following a shuck-fall spray of lead arsenate (1 lb.), were tested on trees that had had a 15 per cent. infestation by *Rhagoletis* during the previous season. Of over 10,000

cherries from two trees, only 0·35 per cent. were injured by *Rhagoletis*, but the lightness of infestation during the preceding year prevents definite conclusions from being drawn from this. Following a shuck-fall spray of lead arsenate (2½ lb.), applications were made of thiodiphenylamine (phenothiazine), flotation-sulphur paste, and soybean flour (3, 6 and ½ lb. per 100 U.S. gals. spray) on 5th and 15th June and one on 24th in which 325-mesh sulphur and powdered skim milk were substituted for flotation-sulphur paste and soybean flour in the same proportions. At harvest, the fruit so sprayed had residues of 0·002 gr. As_2O_3 and 0·007 gr. lead per lb., and only 0·1 per cent. of all the fruit from three trees was injured by *Rhagoletis*. As infestation during the previous year in this orchard had been heavy, this was considered good control. No spray injury to fruit or foliage was noticed.

Crawford (J. C.). **A new Genus and Species of Thysanoptera from Greenhouses.**—*Proc. ent. Soc. Wash.* **40** no. 4 pp. 109–111. Washington, D.C., April 1938.

Descriptions are given of both sexes of *Asprothrips raui*, gen. et sp. n., which was found in great numbers throughout a large series of glasshouses in the New York Botanical Gardens. It occurred on a variety of plants and caused rather serious injury to some of them. Many females were taken, but only one male.

Edwards (W. H.). **Report of the Government Entomologist.**—*Rep. Dep. Sci. Agric. Jamaica 1936* pp. 57–58. Kingston, 1937.

This report covers work in Jamaica in the first ten and last nine weeks of 1936. New varieties of sugar-cane grown under experimental conditions [*cf. R.A.E.*, A **25** 376] showed very low percentages of nodal infestation by *Diatraea saccharalis*, F.; the figures were highest for Co. 281 and Co. 213 (9·1 and 6·5, respectively). Considerable damage to *Citrus* has been caused by *Prepodes vittatus*, L., the adults of which were found to be eaten by *Bufo marinus*. Other insects recorded include: *Apate terebrans*, Pall., on coffee; *Lachnosterna jamaicensis*, Arrow, and *Ligyrus tumulosus*, Burm., on egg-plant (*Solanum melongena*); *Epitrix parvula*, F., on *Capsicum*; *Disonycha laevigata*, Jac., on beet; and *Diabrotica pallipes*, Ol. (*themei*, Baly), *Diaphania* (*Margaronia*) *hyalinata*, L., and *Anasa scorbutica*, F., on cucurbits. *Protoparce sexta jamaicensis*, Btlr., caused serious injury to tobacco in the fields and the green leaves in curing barns; *Apanteles congregatus*, Say, *A. americanus*, Lep., and the Tachinids, *Atacta geminata*, Curr., and *Zenillia distincta*, Wied., which usually keep it under economic control, were not found in the experimental plots at Hope.

Larter (L. N. H.). **Report of the Government Botanist. 6. Insect Pests.**—*Rep. Dep. Sci. Agric. Jamaica 1936* pp. 71–72. Kingston, 1937.

Pests observed in Jamaica during March–October 1936 [*cf.* preceding abstract] included: *Anastrepha longimacula*, Greene, and *Selenothrips rubrocinctus*, Giard, on mango; *Papilio* spp., *Lachnopus aurifer*, Dru., *Eantis thraso*, Hb., and the Membracid, *Idioderma varia*, Van D., on

Citrus ; *Selenaspidus* (*Pseudaonidia*) *articulatus*, Morg., on bananas ; *Erinnys alope*, Dru., on papaya (*Carica papaya*) ; *Apate terebrans*, Pall., on *Melicocca bijuga* and *Caesalpinia coriaria* ; and *Tribolium castaneum*, Hbst. (*ferrugineum*, F.), *Sitodrepa panicea*, L., and *Calandra granaria*, L., in stored ginger.

JERVIS (L. A.). **Insect Control.**—*Rep. agric. mar. Prod. Bd Bahamas 1937* p. 11. Nassau, 1938.

The blue-grey fly [*Aleurocanthus woglumi*, Ashby] and the cottony cushion scale [*Icerya purchasi*, Mask.], which were serious pests of *Citrus* in the Bahamas, are now kept under control by the parasite [*Eretmocerus serius*, Silv.] and the Australian Coccinellid [*Rodolia cardinalis*, Muls.], respectively [*cf. R.A.E.*, A **23** 293].

CLEARE (L. D.). **Status of the Amazon Fly in British Guiana, 1937.**—*Agric. J. Brit. Guiana* **9** no. 1 pp. 12–24, 3 refs. Georgetown, March 1938.

The results are recorded of a survey made during 1937 of the status of the Amazon fly, *Metagonistylum* [*minense*, Tns.], as a parasite of *Diatraea* in British Guiana, where it was introduced and liberated between 1933 and 1935 [*R.A.E.*, A **22** 388, 566 ; **24** 435]. The procedure followed in making the survey is described. *M. minense* was parasitising *D. saccharalis*, F., in 155 of the 212 sugar-cane fields examined on 15 estates, and *D. canella*, Hmps., also in 11 of them. In these fields, 37,332 dead-hearts were cut out, of which 37·9 per cent. contained living *Diatraea*. The Tachinid was parasitising 16 per cent. of the larvae of *D. saccharalis* in fields in which it was present, or 13·7 per cent. in all the fields examined. The corresponding percentages for *D. canella* were 0·32 and 0·23. In 18·4 per cent. of the fields in which the parasite was present, 30 per cent. or more of the larvae of *D. saccharalis* were parasitised. Of 863 larvae of *D. saccharalis* examined, 513, 263, 66, 17 and 4 contained 1, 2, 3, 4 and 5 parasites, respectively. *Thysanus* (*Signiphora*) *dipterophaga*, Girault, a hyperparasite attacking *Stomatodexia* (*Leskiopalpus*) *diadema*, Wied., which is an indigenous parasite of *Diatraea* in British Guiana, was found parasitising *M. minense* in 4 of the 15 estates during the survey. Of the 43 fields examined on these estates, *T. dipterophaga* was found in 13, and of 178 puparia collected, 17 or 9·6 per cent. produced hyperparasites, but this only represents 3·3 per cent. of the total number of larvae and pupae taken. Braconids parasitised 0·94 per cent. of the larvae of *D. saccharalis* examined and 0·3 per cent. of those of *D. canella*.

CLEARE (L. D.). **Plant Legislation in British Guiana and the Caribbean Colonies.**—*Agric. J. Brit. Guiana* **9** no. 1 pp. 25–38. Georgetown, March 1938.

Summaries are given of legislation restricting the importation of plants into British Guiana, Antigua, Barbados, Bermuda, British Honduras, Dominica, Jamaica, Montserrat, St. Kitts-Nevis, St. Lucia, St. Vincent, and Trinidad and Tobago, and internal legislation affecting agriculture in British Guiana. The only insect pest concerned in the internal legislation is *Brassolis sophorae*, L., on coconut [*R.A.E.*, A **24** 619].

BIANCHI (F. A.). **Report on the United States Department of Agriculture East African Fruit Fly Expedition of 1935–36.**—52 pp. typescript. [Washington, D.C.], U.S. Dep. Agric. Bur. Ent. [1936.]

BIANCHI (F. A.) & KRAUSS (N. H.). **Fruit Fly Investigations in East Africa.**—*Hawaii. Plant. Rec.* **41** no. 4 pp. 299–306. Honolulu, 1937.

VAN ZWALUWENBURG (R. H.). **Report of an Expedition to West Africa in Search of Fruit Fly Parasites (1935–1936).**—25 pp. typescript, 2 refs. [Washington, D.C.] U.S. Dep. Agric. Bur. Ent. [1936.] [Recd. 1938.]

The first and third of these reports comprise detailed accounts of two expeditions sent from the United States to East and West Africa to search for fruit-fly parasites suitable for introduction into Hawaii, and the second is a summary of the first. Material was collected from a great variety of indigenous fruits and from a few imported species. In Kenya, *Ceratitis bremii*, Bezzi, was parasitised by *Tetrastichus giffardi*, Silv.; *C. colae*, Silv., by *Opius* sp. and a Miscogasterid; *C. rubivora*, Coq., by *Opius* sp. and *Diachasma* (*O.*) *fullawayi*, Silv.; *Dacus* (*Tridacus*) sp. by *Diachasma fullawayi* and *O. perproximus*, Silv.; and *C. nigra*, Graham, by *Opius* sp., *O. perproximus modestor*, Silv., *D. fullawayi*, a variety of *Microbracon celer*, Szép., *Tetrastichus* sp., *T. giffardianus*, Silv., and an Encyrtid. *C. capitata*, Wied., was parasitised by *O. perproximus*, *O. humilis*, Silv., *D. fullawayi* and a Miscogasterid in Kenya and by *O. giffardi*, Silv., in Tanganyika; *C. cosyra*, Wlk., by *O. humilis* in Kenya and *O. perproximus* in Kenya and Tanganyika; and *C. annonae*, Wlk., by *Opius* sp. in Sierra Leone and *Biosteres caudatus*, Szép., *T. giffardianus* and a Braconid in the French Cameroons. Parasites of various unnamed species of *Ceratitis* were *Opius* sp. and *Spalangia afra*, Silv., in Zanzibar, *O. perproximus* in Kenya, *Tetrastichus* sp. in Uganda, and *D. fullawayi* in Kenya and Uganda. *Dacus* (*Tridacus*) *pectoralis*, Wlk., was parasitised by *S. afra* and *Dirhinus* sp. in Zanzibar; *Dacus* (*Tridacus*) *humeralis*, Bezzi, by *Tetrastichus giffardi* and *Opius* sp. in Tanganyika and *Biosteres caudatus* and *Opius* sp. in the French Cameroons; and *Dacus ciliatus*, Lw. (*brevistylus*, Bezzi) by *O. perproximus* and *S. afra* in Zanzibar and *B. caudatus*, *Opius* sp., and a Braconid in Nigeria. In Sierra Leone, *Ceratitis* (*Trirhithrum*) *coffeae*, Bezzi, was parasitised by *Opius* sp.; *Dacus punctatifrons*, Karsch, by *Tetrastichus giffardianus*; *Ceratitis giffardi*, Bezzi, by *Biosteres caudatus*, *O. perproximus*, and *T. giffardianus*; and *C. punctata* by *O. perproximus*, *Hedylus giffardi*, Silv., and *T. giffardianus*. Parasites reared from mixed batches of fruit-flies were: *Tetrastichus dacicida*, Silv., and *O. perproximus* in Tanganyika and *Opius* and *Ganaspis* spp. in Uganda, all from *C. colae* and *C. punctata*; *O. perproximus* from *C. colae* and *C. capitata* in Tanganyika; *Opius* sp. and a Braconid from *C. punctata* and *Conradtina acroleuca*, Wied., in Nigeria; and *T. giffardianus*, *Biosteres caudatus* and a Braconid from *C. punctata*, *C. annonae* and *Carpophthoromyia* sp. in the French Cameroons.

The only parasites successfully shipped to Hawaii were *O. perproximus*, *Hedylus giffardi* and *Biosteres caudatus*, all from West Africa. A list is given of the known ripening seasons of infested fruits in West Africa.

In the first and third papers, recommendations are made on the seasons and localities most favourable for further proposed work. In a

supplement to the West African report, J. M. McGough enumerates the plants from the fruits of which fruit-flies and their parasites were obtained in the French Cameroons.

BIANCHI (F. A.). **Notes on a new Species of *Pyrophorus* introduced into Hawaii to combat *Anomala orientalis* Waterhouse.**—*Hawaii. Plant. Rec.* **41** no. 4 pp. 319–333, 3 figs. Honolulu, 1937.

An account is given of the bionomics of the predacious Elaterid, *Pyrophorus bellamyi*, Zwaluwenburg, and of its introduction in 1934–35 from Guatemala into Hawaii for the control of white grubs, particularly *Anomala orientalis*, Waterh., infesting sugar-cane [*R.A.E.*, A **24** 505; **25** 613, etc.]. It has not yet been recovered in the field in Hawaii. In Guatemala, it has so far been found only in one sugar-cane plantation near the south-west coast, and most of the larvae were obtained in a sporadically cultivated field in which *Panicum maximum* was growing. They occurred from 1 to 16 inches below the surface of the soil and were most abundant at a depth of 6–8 inches. They travelled considerable distances through the soil in search of food, and collective vertical migrations also appeared to take place. The few pupae found were all in large earthern cells below the surface soil. Only one adult has been seen in the field, and those kept in cages were very sluggish and were never seen pairing or in flight. Females deposited their eggs unevenly throughout loose soil in large jars; two that began to oviposit 35 and 43 days after emergence deposited totals of 685 and 181 eggs, and a third, dissected before oviposition, contained 4,425 eggs.

The larvae are briefly described, and notes are given on the occurrence of prothetely in them under laboratory conditions, and on the luminescence of the larvae and adults. It is thought that there are probably 7 larval instars, but that sometimes more and sometimes less occur. The larvae are exclusively carnivorous, and attack one another under laboratory conditions. They probably feed on a wide variety of insects; the early instars were successfully reared on Psocids and termites, and the later ones on Lamellicorn larvae and pupae of different species. Half-grown larvae collected in the field devoured an average of 1 grub per 6·1 days; many more grubs are killed from being simply injured than from being partly or wholly consumed. Thus, when confined in a small jar, a *Pyrophorus* larva killed 4 grubs daily for 2 weeks. There is usually a fasting period of 3–4 days or more before each moult. In the rearing experiments, approximately equal numbers of individuals completed their life-cycles in one and in two years, but one larva that hatched on 1st June 1934 moulted at least 6 times within 3 years and then showed no tendency to pupate. It is thought that in the field the normal duration of the cycle is probably two years; most of the larvae collected in Guatemala were already large, but did not pupate until about a year later. The prepupal period lasts from 6 days or less to an observed maximum of 21 days. The pupal stage lasted 12–20 days in 215 pupae observed. Adult males and females lived for as long as 63 and 84 days, respectively.

It has been suggested that if *Pyrophorus* were established in Hawaii it might reduce the value of *Campsomeris marginella modesta*, Sm. (*Scolia manilae*, Ashm.) as a parasite of *A. orientalis*, but the author considers that this is unlikely for the following reasons: The fact that the length of the larval stage of the Scoliid is much

shorter than that of its host makes it less likely that *Pyrophorus* will attack the latter when it is bearing a parasite egg or larva. Many of the parasitised grubs occur in the deeper harder soil below the loose upper layer, which is generally frequented by *Pyrophorus* in cultivated fields and which usually harbours the larger part of the *Anomala* population. The parasitised grubs are always completely paralysed, and many of them lie in cavities with walls packed to a hardness considerably greater than that of the surrounding soil. Experiments here described have shown that *Pyrophorus* will attack both active and parasitised grubs, but that in the presence of both, the former are more attractive. *Pyrophorus* is able to live and feed under the thick matting of cane that covers every field in the latter part of each ratoon. This mat tends to impede the entrance of *Campsomeris* and is thought to be the principal cause of the recent increase in the *Anomala* population.

Smith (J. H.). **Entomological Investigations.**—*Rep. Dep. Agric. Stk Qd 1936–37* pp. 79–82. Brisbane, 1937.

Some of the entomological investigations in Queensland dealt with in this report for 1936–37 have already been noticed. *Chortoicetes terminifera*, Wlk., was troublesome in various parts of the state [*cf. R.A.E.*, A **25** 322]; cereal and fodder crops were destroyed by swarms of hoppers or adults between October and March, and oviposition by the autumn generation was heavy in various districts. Egg parasites, particularly *Scelio fulgidus*, Crwf., were active. *Phaulacridium gemini*, Sjöst., attacked irrigated tobacco in November. Control is complicated by migration to the tobacco from grassland. A heavy flight of *Lepidiota caudata*, Blkb., in the Atherton tableland in the late spring of 1935 [*cf.* **25** 162] resulted in serious damage to pasture by white grubs in 1937, made worse by an abnormally low rainfall. Trials on the growing of lucerne in which its manurial requirements and the appropriate bacterial inoculum received consideration indicate that it can be grown profitably in the parts of the country in which there is danger of attack by white grubs. *Heliothis armigera*, Hb. (*obsoleta*, F.) did considerable damage to cotton in some instances, though over the cotton districts as a whole, injury was less severe than in 1935–36. The economic value of dusts against it was doubtful. Promising results were obtained with a modification of the trap-crop method of control in which maize plants between the cotton were swabbed with a mixture of lead arsenate, molasses and water. Malformation of couch grass [*Agropyrum repens*], similar to that attributed to *Eriophyes tenuis*, Nal., in Western Australia and sometimes resulting in the grass being killed back to ground level, was apparently stimulated by *Eriophyes* sp. and *Siteroptes* sp. The weevil, *Aesiotes notabilis*, Pasc., has caused considerable damage to young hoop pine [*Araucaria cunninghami*], which it attacks at saw cuts after pruning. Other pests included *Hercinothrips bicinctus*, Bagn., on banana, *Eutinophoea bicristata*, Lea, on *Citrus*, and *Antarchaea chionosticta*, Turn., *Bucculatrix gossypii*, Turn., and *Earias huegeli*, Rogenh., on cotton.

Ward (K. M.). **The Apple Leafhopper.**—*Qd agric. J.* **49** pt. 3 pp. 214–218, 9 figs. Brisbane, March 1938.

Typhlocyba froggatti, Baker, first appeared in injurious numbers in apple orchards south and south-west of Stanthorpe in the extreme

south-east of Queensland in 1937–38. An account, based on previous work [*cf. R.A.E.*, A **24** 787, etc.] is given of its bionomics and control. Nymphs and adults were also observed on blackberry in the Stanthorpe district; blackberries are widely distributed there and, if the Jassid can breed on them, its spread is likely to be greatly facilitated.

Stanley (G. W.). **Patrol Notes.** *Promecotheca* **Outbreak—Talasea.**—*New Guinea agric. Gaz.* **4** no. 1 p. 37. Rabaul, January 1938. [Recd. May 1938.]

During a survey of the infestation of coconuts along the Talasea coast by *Promecotheca papuana*, Csiki (*antiqua*, Weise) in 1937 [*cf. R.A.E.*, A **26** 435], the measures demonstrated for control comprised sweeping lighted torches underneath fronds carrying the adults and then removing and burning fronds infested with eggs and larvae. *Oecophylla smaragdina*, F., when found or placed on heavily infested palms, was not observed to attack *Promecotheca*. The leaves of *Nipa* [*fruticans*] were found to be severely infested by this Hispid, and as they are extensively used for house roofing, are a probable means of dispersing it.

Froggatt (J. L.). **Mealy Bug on Coffee.**—*New Guinea agric. Gaz.* **4** no. 1 p. 38. Rabaul, January 1938. [Recd. May 1938.]

Specimens from coffee and *Erythrina* of the mealybug that attacked these plants and *Leucaena glauca* in the Territory of New Guinea [*R.A.E.*, A **25** 451] have been found to be *Ferrisiana* (*Ferrisia*) *virgata*, Ckll.

Froggatt (J. L.). **Tanglefoot Banding of Coconut Palms against** *Sexava*.—*New Guinea agric. Gaz.* **4** no. 1 pp. 51–55, 2 graphs. Rabaul, January 1938. [Recd. May 1938.]

The banding adhesive found effective for catching young nymphs of Tettigoniids of the genus *Sexava* attacking coconut in the Territory of New Guinea [*R.A.E.*, A **24** 202] has a resin base. In experiments carried out in Manus by B. A. O'Connor in January–April 1937, this adhesive was compared with one having a waxy base. The latter had been developed to eliminate the damage caused to soft-barked trees (but not to coconut) by direct application of the resin-base mixture; it yielded good catches of nymphs for about 2 weeks but then steadily deteriorated. The resin-base mixture, on the other hand, gave good results for about 10 weeks and showed some efficiency for as long as 4 months. Bands under $4\frac{1}{2}$ ins. wide were not satisfactory in catching or lasting qualities. Nymphs beyond the second instar and adults could cross a 6-in. band, but as they retain some of the adhesive on the tarsi, they would be less able to escape from predators.

Papers noticed by Title only.

Murphy (P. A.). **The Leaf Roll Disease of Potatoes. A Summary of Modern Knowledge** [including data on Aphid vectors].—*J. Dep. Agric. Éire* **35** no. 1 pp. 1–19, 4 pls., 1 fig. Dublin, January 1938.

NITSCHE (G.), KOSSWIG (W.) & FÖRSTER (H.). **Histologische und zytologische Veränderungen in kräuselkranken Rüben.** [Histological and cytological Changes in Beets suffering from the Crinkle Disease transmitted by *Piesma quadratum*, Fieb.]—*NachrBl. dtsch. PflSchDienst* **18** no. 4 pp. 32–34, 8 figs. Berlin, April 1938.

FISCHER (A.). **Die wichtigsten Krankheiten und Schädlinge der Lupinen im Zusammenhang mit dem Anbau der Süsslupinen (S.E.G.) in Deutschland.** [The more important Diseases and Pests of Lupins in Connection with the Cultivation of Sweet Lupins in Germany (a brief review of the literature).]—*Forschungsdienst* **5** pt. 2 pp. 84–91, 66 refs. Neudamm, 1938.

SUBKLEW (W.). **Die Bekämpfung der Elateriden. (Eine Uebersicht über die Literatur.)** [The Control of Elaterids. (A Survey of the Literature.)]—*Z. angew. Ent.* **24** pt. 4 pp. 511–581, 1046 refs. Berlin, February 1938.

ESCHERICH (K.). **Gallwespen (Cynipidae) als Insektenparasiten.** [Cynipids as Parasites of Insects (a general discussion).]—*Z. angew. Ent.* **24** pt. 4 pp. 651–653, 5 figs., 3 refs. Berlin, February 1938.

MORGAN (W. L.). **The Tomato Stem Borer** (*Phthorimaea plaesiosema*, **Turner)** [in New South Wales].—*Agric. Gaz. N.S.W.* **49** pt. 3 pp. 141–142, 3 figs. Sydney, 1st March 1938. [*Cf. R.A.E.*, A **20** 167.]

POTTER (C). **Petroleum Oils as Insecticides and Fungicides** [a summary of the literature].—*The Science of Petroleum* pp. 2843–2847, 68 refs. London, Oxf. Univ. Pr., 1938.

CARROLL (J.). **Mineral Oils as Insecticides** [a general survey].—*Econ. Proc. R. Dublin Soc.* **3** no. 5 pp. 63–74. Dublin, April 1938.

LUPO (V.). **Revisione delle cocciniglie italiane I.** [A Revision of the Italian Coccids, I (the 8 Italian species of *Diaspis*).]—*Boll. Lab. Zool. Portici* **30** pp. 121–162, 28 figs. Portici, 14th March 1938.

SILVESTRI (F.). **Descrizione di tre specie africane di Margarodini (Insecta Homoptera Coccidae).** [Descriptions of new Coccids of the Tribe Margarodini, two from Eritrea and one from Tripolitania.]—*Boll. Ist. Ent. Bologna* **10** pp. 35–43, 4 figs. Bologna, 1st March 1938.

KNOWLTON (G. F.) & ALLEN (M. W.). *Macrosiphum* **Aphids infesting** *Artemisia* [in Utah and adjoining areas, including 5 new species]. —*Canad. Ent.* **70** no. 4 pp. 73–83, 2 pls. Orillia, April 1938.

HORI (M.). **A Revision of the Species of the Tribe Pemphigini occurring in Hokkaido and Saghalien** [including 2 new species]. **(Studies on Aphididae of the Northern Part of Japan, I.).**—*Insecta matsum.* **12** no. 2–3 pp. 109–130, 1 pl., 7 figs. Sapporo, March 1938.

SHINJI (O.) & KONDO (T.). **Aphididae of Manchoukuo with the Description of two new Species.**—*Kontyû* **12** no. 2 pp. 55–69, 1 fig. Tokyo, March 1938.

TAKAHASHI (R.). **Notes on the Aleyrodidae of Japan (Homoptera) VI.**—*Kontyû* **12** no. 2 pp. 70–74, 3 figs. Tokyo, March 1938. [*Cf. R.A.E.*, A **25** 656.]

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